```
Set     Items    Postings   Description
S1     169926     1538162   S (AIM OR AIMING OR TARGET? OR INSERT? OR ALIGN? OR PLACER? OR
PLACEMENT? OR INSTALL?)()(GUIDE? ? OR JIG OR JIGS OR MEMBER? OR APPARATUS? OR DEVICE? OR
TOOL? ? OR APPLIANCE? OR IMPLEMENT? OR INSTRUMENT? OR HOLE? ? OR SLEEV? OR CYLINDER? OR
TUBE?)
S2      22176      200914   S GUIDING?()(JIG OR JIGS OR MEMBER? OR APPARATUS? OR DEVICE? OR
TOOL? ? OR APPLIANCE? OR IMPLEMENT? OR INSTRUMENT? OR HOLE? ? OR SLEEV? OR CYLINDER? OR
TUBE?)
S3      33333      149927   S GUIDING()(CHANNEL? OR GROOV? OR SLOT? OR GUTTER? OR TRENCH?
OR FURROW? OR PASSAGE? OR PIPE?) OR ALIGNER?
S4     357507     2826785   S (DRIVER OR DRIVING? OR TORX OR TORQUE OR ALLEN OR HEX OR
FASTEN? OR TIGHTEN? OR INSTALL? OR PHILLIPS OR FLAT()HEAD OR FLATHEAD OR
HEXAGON?)(2N)(TOOL? ? OR WRENCH? OR JIG OR JIGS OR MEMBER? OR APPARATUS? OR DEVICE? OR
APPLIANCE? OR IMPLEMENT? OR INSTRUMENT?)
S5      38634      255510   S SCREWDRIVER? OR WRENCH? OR (SCREW? OR BRAD? ? OR BOLT? ? OR
PIN)()DRIVER?
S6      39622      913554   S S1:S3 AND S4:S5
S7      17735      594456   S FASTENER? OR PIN OR PINS OR SCREW OR SCREWS OR BRAD OR BRADS
OR BOLT? ? OR ADJUST?R? OR ADJUST?()MECHANISM? OR DRILLBIT? OR DRILL()(BIT OR BITS)
S8      10915      260438   S ELONGATE?()MEMBER? OR NAIL? ? OR ANCHOR? OR FIXATOR? OR
FIXATING? OR THREADED? OR NAIL? OR BRAD? ? OR RIVET? OR STUD? ?
S9       8531      196595   S TACK? ? OR FIXATION OR FIXATE? OR FASTENER?
S10      1797       17436   S (HELIC? OR HELIX? OR COIL? OR SPIRAL? OR THREAD?)(2N)(DEVICE?
OR APPARATUS? OR TOOL? ?)
S11      7543       77106   S RETAINER? OR SECURING OR SECURER? OR PEG? ? OR STAKE? OR
ATTACHER?
S12      2930       32366   S (THREAD? OR HELIC? OR HELIX? OR COIL? OR
SPIRAL?)(2N)(CONNECT?R? OR ROD OR RODS OR POLE? OR SLEEV? OR SHEATH? OR SHAFT? OR NAIL? OR
TACK? ? OR ANCHOR? OR RETAINER? OR PEG OR PEGS OR STAKE?)
S13     16838      520276   S SCREW? OR BRAD? ? OR RIVET? OR PIN OR PINS OR CONNECT?R? OR
FIXAT?R?
S14     15055      180060   S COMBINED OR INTEGRAL OR INTEGRATED OR COMBINATION OR
ALL(2W)ONE OR REVERSIBLE OR REVERS? OR FLIPPING OR TURN?()OVER OR COMPOUND
S15      3277       17020   S UNITED OR SELFCONTAIN? OR SELF()CONTAIN? OR UNITARY? OR
MONOPIECE? OR (FLIP? OR SWITCH?)()(END OR ENDS OR POSITION? OR ORIENTATION?)
S16      9194       56935   S (ONE OR MONO OR UNI)()PIECE? OR INCORPORAT? OR (2 OR
TWO)()WAY OR TWOWAY OR (PIVOT? OR SWING? OR SLUE?)()AROUND
S17     15923      608754   S PLATE? OR PANEL? OR FLAT()PIECE? OR BRACKET? OR PLANK? OR
PANE? ? OR BASEPLATE?
S18       507        4706   S METALPLATE? OR METALSHEET? OR METAL?()SHEET? OR BACKPLATE? OR
FACEPLATE?
S19      3155       65527   S MEDICAL? OR SURGER? OR SURGEON? OR PHYSICIAN? OR DOCTOR? OR
CHIRURG? OR ORTHOPED? OR ORTHOPAED? OR ORTHO()(PEDIC? OR PAEDIC?) OR TREPHIN?
S20       884        9927   S OSTE? OR OSSO? OR OSTO? OR OSSE? OR ENDOSTE? OR PERIOSTE?
S21      2104      114105   S BONE? ? OR ORTHOPED? OR ORTHOPAED? OR OSSEOUS? OR SKELET?
S22     30438     2156423   S METHOD? OR SYSTEM?? OR PROCESS?? OR PROCEDUR? OR TECHNIQUE?
OR MANNER? OR MODE? OR MEANS OR ROUTINE? OR PROTOCOL?
S23         1           2   S AU=(ELLIOTT E? OR ELLIOTT, E? OR ELLIOTT M? OR ELLIOTT, M?)
S24         0           0   S ELLIOTT(2N)(ERIC OR MATT OR MATTHEW)
S25      2816        6688   S IC=(A61B? OR A61F?)
S26     13588     1614623   S S6 AND S7:S13 AND S14:S16
S27      2817      693101   S S26 AND (S19:S21 OR S25)
S28      1685      562653   S S27 AND S17:S18
S29     13588     2123689   S S26:S28
S30       606      250757   S S29 AND S1:S3(10N)S4:S5 AND S1:S5(7N)S7:S13 AND
S1:S5(7N)S14:S16
S31       177      144790   S S30 AND (S19:S21 OR S25)
S32       170      140718   S S30 AND S19:S21
S33       177      192900   S S31:S32
S34       536      345134   S S30 AND S22
S35       440      345307   S S34 AND S22(7N)(S1:S5 OR S17:S21)
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S36         163      279669   S S32 AND S35
S37         170      311522   S S32 OR S36
S38         110       18989   S S35 FROM 350
S39         108       19971   S S38 AND AY=1970:2004
S40         105       18341   S S38 NOT AY=2005:2007
S41         155      185737   S S33 NOT S38
S42         138      167638   S S41 AND AY=1970:2004
S43         129      159325   S S41 NOT AY=2005:2007
S44         246      223917   S S39:S40 OR S42:S43
S45         246      108902   IDPAT (sorted in duplicate/non-duplicate order)
S46         241      106239   IDPAT (primary/non-duplicate records only)
 ; show files
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[File 350] **Derwent WPIX** 1963-2007/UD=200745
(c) 2007 The Thomson Corporation. All rights reserved.
**File 350: DWPI has been enhanced to extend content and functionality of the database. For more info, visit http://www.dialog.com/dwpi/.*

[File 348] **EUROPEAN PATENTS** 1978-2007/ 200729
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**File 348: For important information about IPCR/8 and forthcoming changes to the IC= index, see HELP NEWSIPCR.*

[File 349] **PCT FULLTEXT** 1979-2007/UB=20070712UT=20070705
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**File 349: For important information about IPCR/8 and forthcoming changes to the IC= index, see HELP NEWSIPCR.*

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46/5/179 (Item 179 from file: 349) **Links**
PCT FULLTEXT

01140791
SUTURE ANCHOR DEVICE AND METHOD OF USING
DISPOSITIF DE SOUTURE SAGITTE ET PROCEDE D'UTILISATION

Patent Applicant/Patent Assignee:

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- **NUUTINEN Juha-Pekka**; 700 Lower State Road, Apt. 22 B-3, North Wales, PA 19454
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Legal Representative:

- **BEETZ & PARTNER(agent)**
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	Country	Number	Kind	Date
Patent	WO	200462459	A2-A3	20040729
Application	WO	2004EP79		20040108
Priorities	US	2003338685		20030109

Designated States: (All protection types applied unless otherwise stated - for applications 2004+)
AE; AG; AL; AM; AT; AU; AZ; BA; BB; BG;
BR; BW; BY; BZ; CA; CH; CN; CO; CR; CU;
CZ; DE; DK; DM; DZ; EC; EE; EG; ES; FI;
GB; GD; GE; GH; GM; HR; HU; ID; IL; IN;
IS; JP; KE; KG; KP; KR; KZ; LC; LK; LR;
LS; LT; LU; LV; MA; MD; MG; MK; MN; MW;
MX; MZ; NA; NI; NO; NZ; OM; PG; PH; PL;

PT; RO; RU; SC; SD; SE; SG; SK; SL; SY;
TJ; TM; TN; TR; TT; TZ; UA; UG; US; UZ;
VC; VN; YU; ZA; ZM; ZW;

[EP] AT; BE; BG; CH; CY; CZ; DE; DK; EE; ES;
FI; FR; GB; GR; HU; IE; IT; LU; MC; NL;
PT; RO; SE; SI; SK; TR;

[OA] BF; BJ; CF; CG; CI; CM; GA; GN; GQ; GW;
ML; MR; NE; SN; TD; TG;

[AP] BW; GH; GM; KE; LS; MW; MZ; SD; SL; SZ;
TZ; UG; ZM; ZW;

[EA] AM; AZ; BY; KG; KZ; MD; RU; TJ; TM;

Main International Patent Classes (Version 7):

IPC	Level
A61B-017/064	Main
A61B-017/04	

Publication Language: English
Filing Language: English
Fulltext word count: 8532

English Abstract:

The present invention provides a suture arrow device (10) for repairing tissue or attaching matter to tissue. The suture arrow device (10) comprises at least two tissue arrows or implantation members (l, 2) connected by a connecting member (3) which preferably is a suture thread. The invention further provides an **insertion instrument** for **installing** the suture arrow device (10) into tissue. The suture arrow device (10) and the **insertion instrument** may be **combined** in an installation kit.

French Abstract:

La presente invention concerne un dispositif de souture sagitte (10) servant a reparer un tissu ou a fixer une matiere a un tissu. Le dispositif de souture sagitte (10) comprend au moins deux fleches tissulaires ou elements d'implantation (1, 2) relies par un element de raccord (3) qui est, de preference, un fil de suture. L'invention concerne en outre un instrument d'insertion servant a mettre en place le dispositif de souture sagitte (10) a l'interieur du tissu. Le dispositif de souture sagitte (10) et l'instrument d'insertion peuvent etre combines dans une trousse d'installation.

Type	Pub. Date	Kind	Text
Publication	20040729	A2	Without international search report and to be republished upon receipt of that report.
Search Rpt	20041021		Late publication of international search report
Republication	20041021	A3	With international search report.

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PCT

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(51) International Patent Classification[7]: A61F 2/46, A61B 17/88

(21) International Application Number: PCT/US2004/004534

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(30) Priority Data:
60/446,963 12 February 2003 (12.02.2003) US
10/430,473 6 May 2003 (06.05.2003) US

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(74) Agents: **REVIS, Paul, A.** et al.; MC LC340, 710 Medtronic Parkway, Minneapolis, MN 55432 (US).

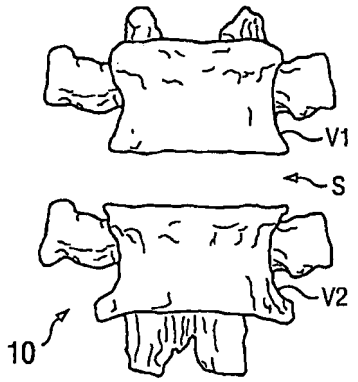
(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— *without international search report and to be republished upon receipt of that report*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: INSTRUMENTS AND METHODS FOR ALIGNING IMPLANTS FOR INSERTION



(57) Abstract: An assembly (20) for aligning a prosthetic device for insertion into an intervertebral space (5) is provided. The assembly includes an alignment instrument (22), a first clamp assembly (52) slidably engaged with the alignment instrument, a second clamp assembly (54) slidably engaged with the first clamp assembly, and an implantation device (24) slidably engaged with the second clamp assembly, the implantation device being adapted to retain a prosthetic device thereon.

WO 2004/071360 A2

15. The assembly of claim 14 wherein the means for aligning the alignment instrument is a radiographic marker adapted to cooperate with a fluoroscopic machine.

16. The assembly of claim 14 wherein the means for aligning the alignment instrument is a bubble level device operatively connected to the alignment instrument.

17. The assembly of claim 12 wherein the first clamp assembly comprises a connector, the connector being adapted to lock the first clamp assembly, thereby restricting movement of the first clamp assembly along the alignment instrument.

18. The assembly of claim 12 wherein the second clamp assembly comprises a connector, the connector being adapted to lock the second clamp assembly, thereby restricting movement of the second clamp assembly along the first clamp assembly.

19. The assembly of claim 18 wherein the second clamp assembly comprises an additional connector, the additional connector being adapted to lock the implantation device, thereby restricting movement of the implantation device along the second clamp assembly.

20. A method for aligning a prosthetic device for insertion into an intervertebral space, comprising providing an alignment instrument having an anchoring device extending therefrom, engaging the anchoring device with a vertebral body located adjacent to the intervertebral space, aligning the alignment instrument relative to the intervertebral space, driving the anchoring device into the vertebral body, and providing an implantation device adjacent to the alignment instrument via a clamp assembly operatively connected to the alignment instrument, the implantation device holding the prosthetic device at a distal end thereof.

21. The method of claim 20 wherein aligning the alignment instrument comprises aligning a radiographic marker disposed within the alignment instrument via a fluoroscopic machine.

22. The method of claim 20 wherein aligning the alignment instrument comprises viewing a bubble level device operatively connected to the alignment instrument.

23. The method of claim 20 wherein the clamp assembly is operatively connected to the alignment instrument via a second clamp assembly.

24. The method of claim 23 further comprising slidably adjusting the second clamp assembly along the alignment instrument to position the prosthetic device adjacent to the intervertebral space

25. The method of claim 24 further comprising locking the second clamp assembly to the alignment instrument.

26. The method of claim 25 further comprising slidably adjusting the first clamp assembly along the second clamp assembly to further position the prosthetic device adjacent to the intervertebral space.

27. The method of claim 26 further comprising locking the first clamp assembly to the second clamp assembly.

28. The method of claim 27 further comprising slidably adjusting the implantation device along the first clamp assembly to further position the prosthetic device adjacent to the intervertebral space.

29. The method of claim 28 further comprising locking the implantation device to the first clamp assembly.

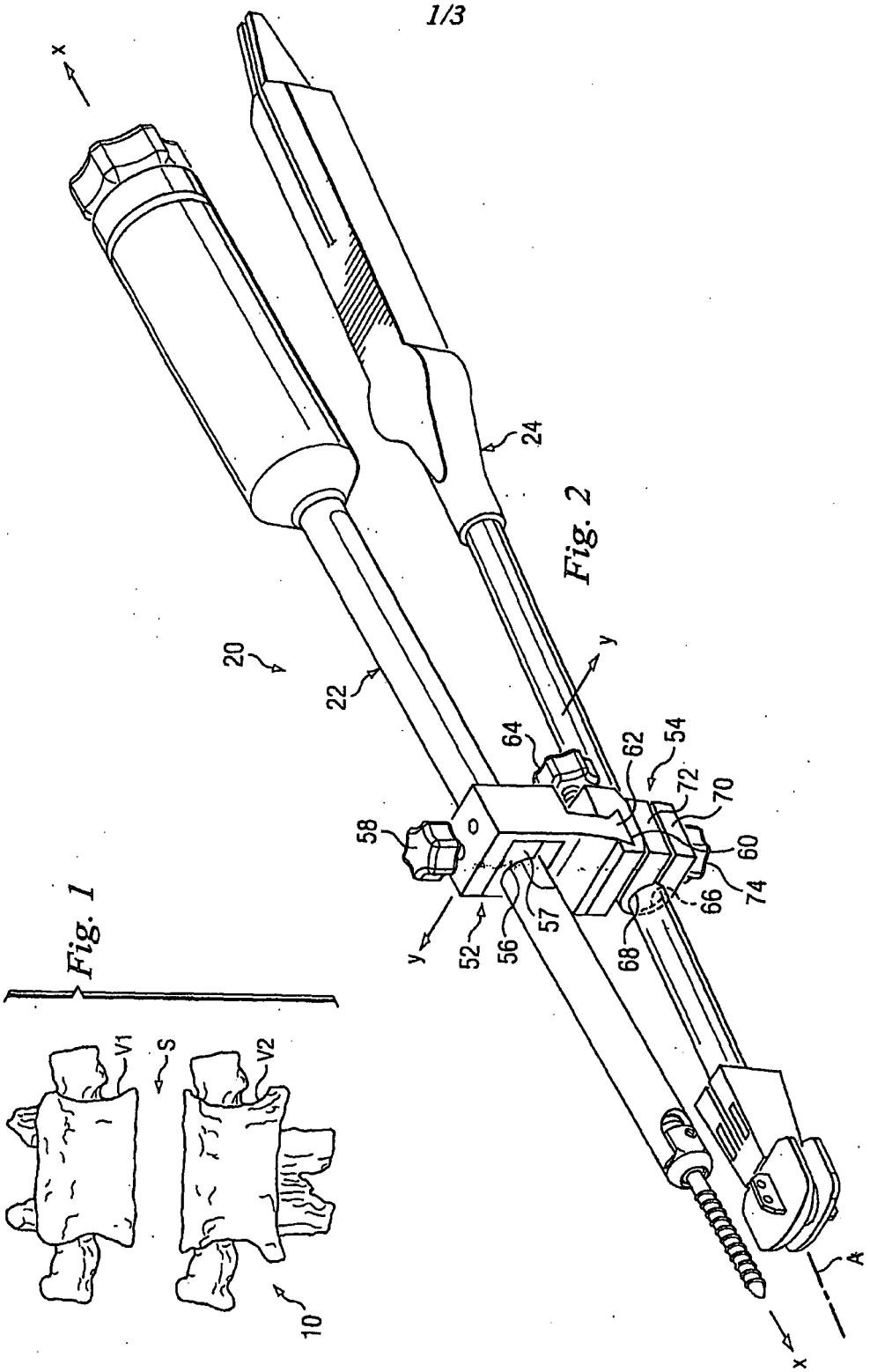


Fig. 2

Fig. 1

46/5/171 (Item 171 from file: 349) Links
PCT FULLTEXT

01245463

METHODS AND DEVICES FOR INSERTING AND ENGAGING VERTEBRAL IMPLANTS IN MINIMALLY INVASIVE PROCEDURES

PROCEDES ET DISPOSITIFS DESTINES A L'INSERTION ET A LA MISE EN PLACE D'IMPLANTS VERTEBRAUX DANS DES PROCEDURES AVEC EFFRACTION MINIMALE

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  (Designated only for: US)

Patent Applicant/Inventor:

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	Country	Number	Kind	Date
Patent	WO	200551247	A2-A3	20050609
Application	WO	2004US38922		20041118
Priorities	US	2003718072		20031120

Designated States: (All protection types applied unless otherwise stated - for applications 2004+)
AE; AG; AL; AM; AT; AU; AZ; BA; BB; BG;
BR; BW; BY; BZ; CA; CH; CN; CO; CR; CU;
CZ; DE; DK; DM; DZ; EC; EE; EG; ES; FI;
GB; GD; GE; GH; GM; HR; HU; ID; IL; IN;
IS; JP; KE; KG; KP; KR; KZ; LC; LK; LR;

LS; LT; LU; LV; MA; MD; MG; MK; MN; MW;
MX; MZ; NA; NI; NO; NZ; OM; PG; PH; PL;
PT; RO; RU; SC; SD; SE; SG; SK; SL; SY;
TJ; TM; TN; TR; TT; TZ; UA; UG; US; UZ;
VC; VN; YU; ZA; ZM; ZW;

[EP] AT; BE; BG; CH; CY; CZ; DE; DK; EE; ES;
FI; FR; GB; GR; HU; IE; IS; IT; LU; MC;
NL; PL; PT; RO; SE; SI; SK; TR;

[OA] BF; BJ; CF; CG; CI; CM; GA; GN; GQ; GW;
ML; MR; NE; SN; TD; TG;

[AP] BW; GH; GM; KE; LS; MW; MZ; NA; SD; SL;
SZ; TZ; UG; ZM; ZW;

[EA] AM; AZ; BY; KG; KZ; MD; RU; TJ; TM;

Main International Patent Classes (Version 7):

IPC	Level
A61F-002/46	Main
A61B-017/068	
A61B-017/88	

Publication Language: English
Filing Language: English
Fulltext word count: 5263

English Abstract:

A surgical instrument assembly (10) includes an inserter instrument (20) and a driving instrument (11) to engage an implant (120) to a bony structure in a patient. The inserter instrument (20) is positionable in a patient with the implant (120) engaged thereto to position the implant (120) at an operative site in the patient. A driving instrument (11) is engageable to the inserter instrument (20) to engage the implant (120) to bony structure at the operative site. A template (150) is provided and engageable by the driving instrument (11) to facilitate preparation of the bony structure to receive the implant (120).

French Abstract:

L'invention concerne un ensemble d'instruments chirurgicaux (10) comprenant un instrument porte-prothese (20) et un instrument de mise en place (11) destine a la mise en place d'un implant (120) dans une structure osseuse d'un patient. L'instrument porte-prothese (20) peut etre positionne dans un patient avec l'implant (120), de facon que l'implant (120) soit situe dans site d'intervention dans le patient. L'instrument de mise en place (11) peut etre relie a l'instrument porte-prothese (20) de facon que l'implant (120) soit mis en place dans la structure osseuse situee au niveau du site d'intervention. L'ensemble comprend egalement un gabarit (150) concu pour entrer en prise avec l'instrument de mise en place (11), destine a faciliter la preparation de la structure osseuse pour la reception de l'implant (120).

Type	Pub. Date	Kind	Text

46/5/42 (Item 42 from file: 350) **Links**
Derwent WPIX

0010071225 *Drawing available*
WPI Acc no: 2000-377363/200033
XRPX Acc No: N2000-283327
The set of endoscopic instruments comprises anchor element, bone plates, connecting element, screw driver and holder of insertion sleeve and centering element
Patent Assignee: AESCULAP AG & CO KG (AESC-N)
Inventor: BEGER J

Patent Family (3 patents, 2 countries)

Patent Number	Kind	Date	Application Number	Kind	Date	Update	Type
DE 19851370	A1	20000518	DE 19851370	A	19981107	200033	B
DE 19851370	C2	20000921	DE 19851370	A	19981107	200047	E
US 6299616	B1	20011009	US 1999435103	A	19991105	200162	E

Priority Applications (no., kind, date): DE 19851370 A 19981107

Patent Details

Patent Number	Kind	Lan	Pgs	Draw	Filing Notes
DE 19851370	A1	DE	13	5	

Alerting Abstract DE A1
NOVELTY - The endoscopic set of **insertion instruments incorporates** at least one **anchor** element connected to a **bone-plate**; at least one connecting element for joining at least two **bone plates**; a **screw-driver**; and elongated holder (1) for the **bone plate**. The holder comprises an **insertion-sleeve** (18) and a centering element (19) separably joined when **screwed** in by a coupling mechanism (25,27;33,34) on one end of an elongated sleeve forming the centering element. The coupling mechanism is formed of a lock-in connection with at least one lug (34) as protuberance.
USE - Set of endoscopic instruments for spinal column implant **system** .
ADVANTAGE - The number of parts in the set of instruments is reduced and the centering element more easily handled.
DESCRIPTION OF DRAWINGS - The drawing shows a longitudinal section through a **screw**-in tool joined to a holder when an **anchor** element is being **screwed** into a **bone** part.
1 Holder
18 **Insertion sleeve**
19 Centering element
25,27,33,34 Coupling mechanism

Title Terms /Index Terms/Additional Words: SET; ENDOSCOPE; INSTRUMENT; COMPRISE; **ANCHOR**; ELEMENT; **BONE**; **PLATE**; CONNECT; **SCREW**; DRIVE; HOLD; INSERT; SLEEVE; CENTRE

Class Codes

International Patent Classification

IPC	Class Level	Scope	Position	Status	Version Date
A61F-002/44; **A61F-005/00**			Main		"Version 7"

US Classification, Issued: 606086000, 606061000

File Segment: EngPI; ;
DWPI Class: P32

US006299616B1

(12) **United States Patent**
Beger

(10) **Patent No.: US 6,299,616 B1**
(45) **Date of Patent: Oct. 9, 2001**

(54) **ENDOSCOPIC INSERTION APPARATUS**

(75) Inventor: **Jens Beger**, Tuttlingen (DE)

(73) Assignee: **Aesculap AG & Co. KG**, Tuttlingen (DE)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/435,103**

(22) Filed: **Nov. 5, 1999**

(30) **Foreign Application Priority Data**

Nov. 7, 1998 (DE) 198 51 370

(51) **Int. Cl.**[7] **A61F 5/00**
(52) **U.S. Cl.** **606/86**; 606/61
(58) **Field of Search** 606/65, 86, 61, 606/104; 623/17.15

(56) **References Cited**

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2 718 943 10/1995 (FR).
WO 95/25487 9/1995 (WO).

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Aesculap Leaflet, "The Spine Masters," SOCON Spinal System, Leaflet No. 0–066–02, Jun. 1998.

* cited by examiner

Primary Examiner—Gene Mancene
Assistant Examiner—Melba Bumgarner
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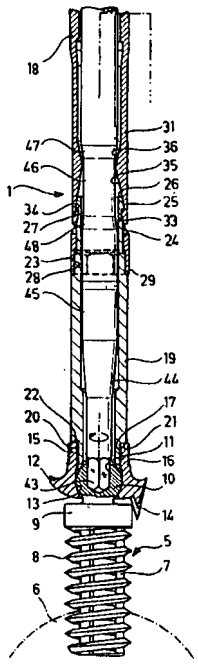
(57) **ABSTRACT**

An endoscopic insertion apparatus for a spinal column implant system is provided having a screwing-in tool and an elongated holding device for holding a bone plate. The implant system essentially comprises at least one anchoring element, a bone plate connected to the anchoring element and at least one connection element for connecting at least two bone plates. The holding device comprises an insertion sleeve and a centering element. The centering element and the insertion sleeve can be connected to one another in a screwing-in position by a coupling mechanism in the direction of a longitudinal axis of the holding device, and the centering element and insertion sleeve can be separated from one another in a centering position. The invention reduces the number of parts used as compared to prior art insertion apparatus and simplifies handling, particularly of the centering element, since the centering element is provided as part of the holding device.

30 Claims, 4 Drawing Sheets



encounters the sleeve end **39**. The exertion of pressure onto the pressure edge **68** of the blocking slide **58** moves the blocking slide **58** transversely with respect to the longitudinal axis of the screwing-in tool, and this means that the screwing-in tool **2** can now be pushed further forward into the holding device **1**. If an axial position as shown in FIG. **1** is reached, the pressure on the blocking slide **58** is reduced and the inner edge **66** of the blocking slide **58** slides forward into the annular groove **38**. In this way, the grip unit **41** is connected to one end of the guide sleeve **18** and is fixed in the axial direction. While the screwing-in tool **2** was being inserted into the holding device **1**, which already has the hollow screw **5** screwed onto it, the hexagon **43** slid into the inner hexagon **11** of the ball head **10** of the hollow screw **5**.

The preparations described above have now produced a unit comprising the holding device **1**, the screwing-in tool **2** and the hollow screw **5**. The hollow screw **5** can now be attached to a vertebra **6** and can be screwed into the vertebra **6** by turning the hand grip **52** of the screwing-in tool **2**. For this, the hand grip **52** has to be turned clockwise out of sight of the surgeon, as indicated in FIG. **1**. The hollow screw **5** is now screwed into the vertebra **6** to an extent such that the spikes **14** have not yet penetrated the vertebra **6**.

In a subsequent step, the guide sleeve **18** is separated from the centering piece **19**, specifically by withdrawing the screwing-in tool **2** from the holding device **1**. To detach the screwing-in tool **2** from the guide sleeve **18**, the blocking slide **58** must first be released from its locked position. This is done, in turn, by exerting pressure onto the pressure edge **68**. The screwing-in tool **2** can now be withdrawn from the guide sleeve **18** in the axial direction. During this movement, the transitional region **48** slides on the unlocking surface **35** of the tool insert **42**, which stretches the leaf spring **31** radially outwards. This causes the latching lug **34** to move out from its latching position behind the latching edge **27** and release the latter, as shown in FIG. **3**. The guide sleeve **18** and the centering piece **19** are now unlocked and can be separated from one another in the axial direction. The centering piece **19** remains on the hollow screw **5**.

A further centering piece **19** is once again assembled using the withdrawn unit comprising the screwing-in tool **2** and the guide sleeve **18** in the manner described, after it has been connected to a further hollow screw **5**. Using the procedure which is already known, the further hollow screw **5** is screwed into an adjacent vertebra **6**. The guide sleeve **18** is then separated from the centering piece **19**, in the manner which is already known, by withdrawing the screwing-in tool **2**.

The two centering pieces can now be used to thread a connection plate **81** and thus place it into the connection plate mounts **82** so as to connect the two hollow screws **5**. Instead of a connection plate **81**, two connection rods **83** can also be provided.

To fix the connection plate **81** or the connection rods **83** to the vertebra plates **12** of the hollow screws **5**, a clamp nut **73** is placed into the nut mount **72** of the socket wrench **3**. The socket wrench **3** is now guided, together with the clamp nut **73**, over the centering piece **19**, and the internal thread of the clamp nut **73** is screwed onto the clamp screw thread **16** and firmly tightened. The socket wrench **3** is then withdrawn and fitted with another clamp nut **73**. The socket wrench **3** is inserted over the further centering piece **19** in a similar way and the clamp screw **73** is first screwed loosely to the vertebra plate **12**.

If appropriate, a traction apparatus (not shown) can be used at this stage to set the distance between the two vertebrae **6** as desired. As soon as the desired distance has been achieved, the socket wrench **3** is used to screw the other clamp nut **73** firmly to the second vertebra plate **12** as well. The two vertebrae **6** are now firmly connected to one another via the connection plate **81**.

To bring the hollow screws **5** into their final position, the centering piece **19** must first be removed. For this, the guide sleeve **18** is fitted over the centering piece **19** and latched to it, as described further above. The guide sleeve **18** and the centering piece **19** are thus connected to one another so as not to rotate. An open-ended wrench (not shown) can be used to remove the holding device **1** from the hollow screw **5** by means of the removal hexagon **54** by turning the holding device **1** anticlockwise.

If the two centering pieces **19** are removed from the hollow screws **5** in this way, the screwing-in tool **2** can be engaged in the inner hexagon **11** of the ball head **10** of the hollow screw **5** again. The hollow screw **5** is now screwed into the vertebra **6** until the spikes **14** penetrate the vertebra **6** and the vertebra plate **12** bears against the vertebra **6**.

To prevent further rotation of the vertebra plate **12** relative to the ball head **10**, a clamp screw **79** is placed onto the shaping tool **78** of the clamp screw key **4** and **15** screwed to the vertebra plate **12**. A clamp thread **80** of the clamp screw **79** then engages in the holding thread **17** of the sleeve section **15** of the vertebra plate **12**. The two vertebrae **6** are finally fixed when the two hollow screws **5** are provided with a clamp screw **79** which is tightened so firmly that relative movement of the vertebra plate **12** and the ball head **10** becomes impossible. The clamp screw key **4** can then be removed from the patient's body again.

What is claimed is:

1. Endoscopic insertion apparatus for a spinal column implant system, said implant system having at least one anchoring element, a bone plate connected to the anchoring element, and at least one connection element for connecting at least two bone plates, said apparatus comprising:

a screwing-in tool; and

an elongated holding device for holding the bone plate, wherein:

the holding device comprises an insertion sleeve and a centering element,

the centering element and the insertion sleeve are connectable to one another in a screwing-in position by a coupling mechanism in the direction of a longitudinal axis of the holding device,

the centering element and the insertion sleeve are separable from one another in a centering position,

the coupling mechanism comprises a latch connection having at least one projecting latching lug and at least one projecting latching edge, and

said latching lug being arranged on one of said centering element or said insertion sleeve and the latching edge is arranged on the other of said centering element or said insertion sleeve.

2. Endoscopic insertion apparatus according to claim **1**, wherein the centering element is formed by an elongated sleeve, at one end of which there is a part of the coupling mechanism.

3. Endoscopic insertion apparatus according to claim **1**, wherein the latching lug is arranged resiliently on one of said centering element or said insertion sleeve in a radial direction in relation to the longitudinal axis of the holding device.

4. Endoscopic insertion apparatus according to claim **1**, wherein the latching lug is arranged on a leaf spring, said leaf spring being arranged in the peripheral wall of the

insertion sleeve, so as to point in the direction of the longitudinal axis of the holding device.

5. Endoscopic insertion apparatus according to claim 4, wherein the latch connection is operationally connected to a release projection for releasing the latch connection.

6. Endoscopic insertion apparatus according to claim 5, wherein:

the release projection is arranged on a surface of the leaf spring which points in the direction of the longitudinal axis, and

the release projection is provided with slide surfaces which rise and fall in the axial direction.

7. Endoscopic insertion apparatus according to claim 1, wherein the latching edge is formed by an annular projection protruding in the radial direction on the centering element.

8. Endoscopic insertion apparatus according to claim 1, wherein the centering element and the insertion sleeve are connectable so as not to rotate.

9. Endoscopic insertion apparatus according to claim 1, wherein:

the coupling mechanism comprises a positively locking non-rotating connection between the centering element and the insertion sleeve.

10. Endoscopic insertion apparatus according to claim 9, wherein:

the positively locking connection is formed by a polygonal connection having an inner polygon and an outer polygon, and

an axis of symmetry of the polygonal connection is formed by the longitudinal axis of the holding device.

11. Endoscopic insertion apparatus according to claim 10, wherein the polygonal connection is formed by a hexagonal connection.

12. Endoscopic insertion apparatus according to claim 1, wherein an end of the centering element bears a mounting element for the bone plate.

13. Endoscopic insertion apparatus according to claim 12, wherein the mounting element is formed by a screw thread which corresponds with a screw thread of the bone plate.

14. Endoscopic insertion apparatus according to claim 13, wherein the screw thread of the mounting element is designed as an external thread and the screw thread of the bone plate is designed as an internal thread.

15. Endoscopic insertion apparatus according to claim 1, wherein:

an end of the insertion sleeve is connectable to the screwing-in tool in a screwing-in position, and

the insertion sleeve is separable from the screwing-in tool in a separating position.

16. Endoscopic insertion apparatus according to claim 1, wherein the screwing-in tool has a handle and a tool element.

17. Endoscopic insertion apparatus according to claim 16, wherein the handle has a mount for the tool element and is detachable from the tool element.

18. Endoscopic insertion apparatus according to claim 16, wherein the handle is formed by a ratchet grip.

19. Endoscopic insertion apparatus according to claim 16, wherein a part of the handle is connectable to the tool element so as not to rotate.

20. Endoscopic insertion apparatus according to claim 16, wherein the screwing-in tool is lockable to the holding device in the axial direction by a locking device having at least one resilient projection on the screwing-in tool and a corresponding recess on the holding device.

21. Endoscopic insertion apparatus according to claim 16, wherein an end of the tool element is provided with a polygon which is insertable in a positively locking manner into a tool mount of the anchoring element.

22. Endoscopic insertion apparatus according to claim 1, wherein an end of the insertion sleeve is provided with a polygonal screw drive.

23. Endoscopic insertion apparatus according to claim 22, wherein the polygonal screw drive is a hexagon.

24. Endoscopic insertion apparatus according to claim 1, wherein the insertion apparatus has an actuation member for detaching the insertion sleeve from the centering element.

25. Endoscopic insertion apparatus according to claim 24, wherein the actuation member is formed by a projection which is arranged on the screwing-in tool and interacts with a release projection on the holding device when the screwing-in tool located in the holding device is withdrawn from the holding device.

26. Endoscopic insertion apparatus according to claim 25, wherein the actuation projection is formed by a section of the screwing-in tool whose diameter is larger than adjacent sections of the screwing-in tool.

27. Endoscopic insertion apparatus according to claim 1, further comprising:

a clamp element guide tool having a first end which has a mount for a clamp element, wherein the clamp element is placeable symmetrically in said mount in a positively locking manner.

28. Endoscopic insertion apparatus according to claim 27, wherein:

the clamp element guide tool comprises a sleeve, and

the centering element is insertable into the clamp element guide tool.

29. Endoscopic insertion apparatus according to claim 27, wherein a second end of the clamp element guide tool is provided with a handle.

30. Endoscopic insertion apparatus according to claim 1, wherein the centering element has an axial stop for at least one of the bone plate and the insertion sleeve.

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23/5/1 (Item 1 from file: 350) **Links**
Derwent WPIX

0015128585 *Drawing available*
WPI Acc no: 2005-478118/200548
XRPX Acc No: N2005-389207
Targeting guide and driver instrument for orthopedic surgery, has handle with end that attaches driver, and another end that attaches targeting guide
Patent Assignee: ELLIOTT E M (ELLI-I)
Inventor: **ELLIOTT E M**

Patent Family (1 patents, 1 countries)

Patent Number	Kind	Date	Application Number	Kind	Date	Update	Type
US 20050149045	A1	20050707	US 2004750787	A	20040102	200548	B

Priority Applications (no., kind, date): US 2004750787 A 20040102

Patent Details

Patent Number	Kind	Lan	Pgs	Draw	Filing Notes
US 20050149045	A1	EN	6	3	

EAST Search History

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L5	2	("5,713,793").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	OFF	2007/07/20 07:59
L6	2	("5,632,483").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	OFF	2007/07/20 07:59
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L12	330	(269/16).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	OFF	2007/07/20 07:59
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L14	427	(81/487).CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	OFF	2007/07/20 07:59
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L22	27	("1271816" | "1592987" | "1688181" | "1699266" | "1758162" | "2506922" | "2556395" | "3121572" | "3782432" | "3825048" | "3902384" | "4328721" | "4581962" | "4779494" | "4827812" | "5025688" | "5056387" | "5279187" | "5954463").PN.	US-PGPUB; USPAT; USOCR	OR	ON	2007/07/20 07:59
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L24	26	("1389468" | "2718806" | "2772590" | "2790343" | "3889558" | "3916734" | "3983759" | "4165660" | "4328720" | "4424984" | "4517862" | "4577534" | "4616845" | "4695073" | "4736964" | "4753454" | "4973075" | "5044659" | "5098117" | "5129669" | "6047789" | "RE33179").PN.	US-PGPUB; USPAT; USOCR	OR	ON	2007/07/20 07:59
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June 21, 1938. P. G. E. HANICKE 2,121,193

FRACTURE CLAMPING APPARATUS

Original Filed Dec. 21, 1932 2 Sheets-Sheet 1

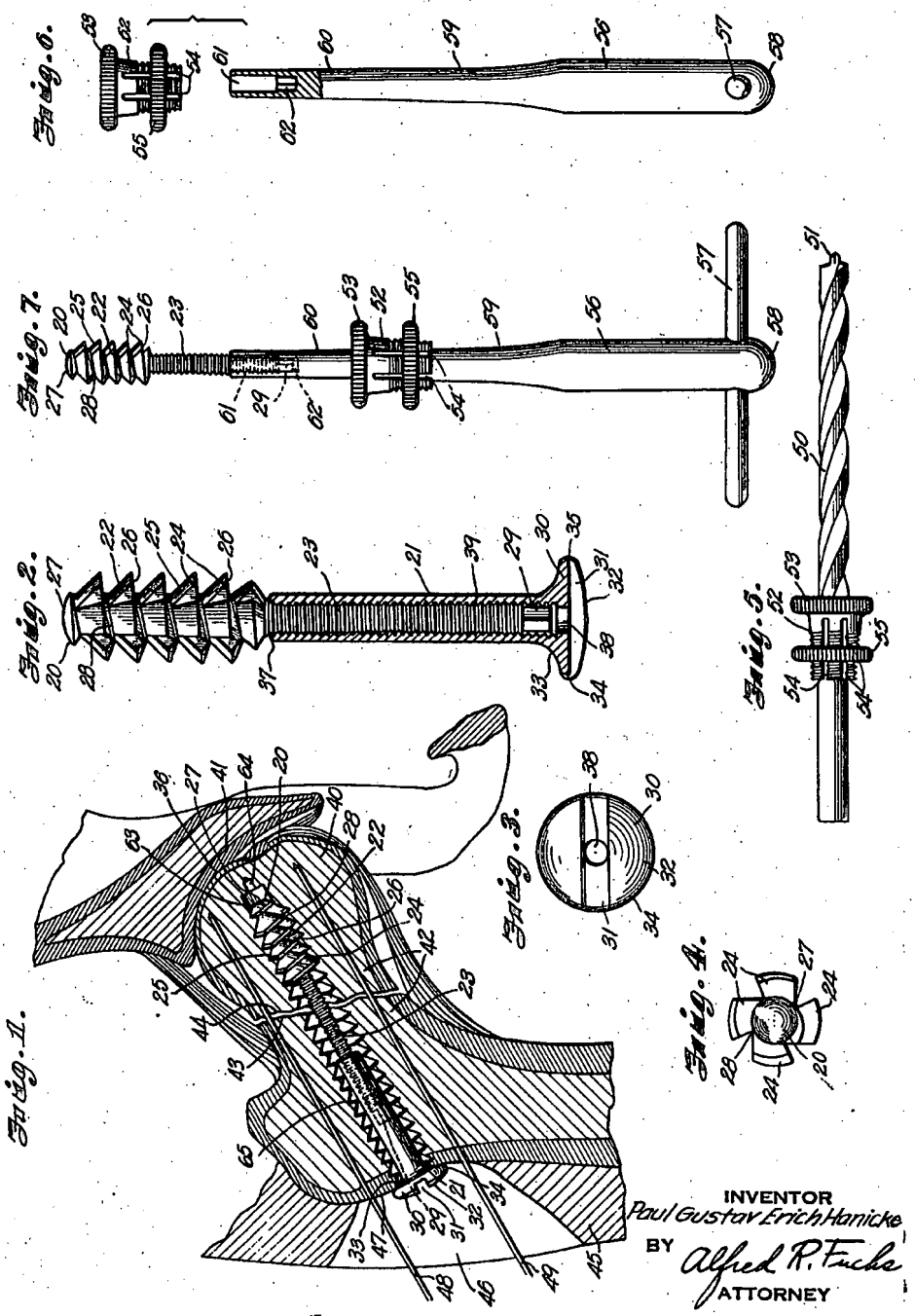

Fig. 6.

Fig. 7.

Fig. 2.

Fig. 5.

Fig. 3.

Fig. 4.

Fig. 1.

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FRACTURE CLAMPING APPARATUS

Original Filed Dec. 21, 1932 2 Sheets-Sheet 2

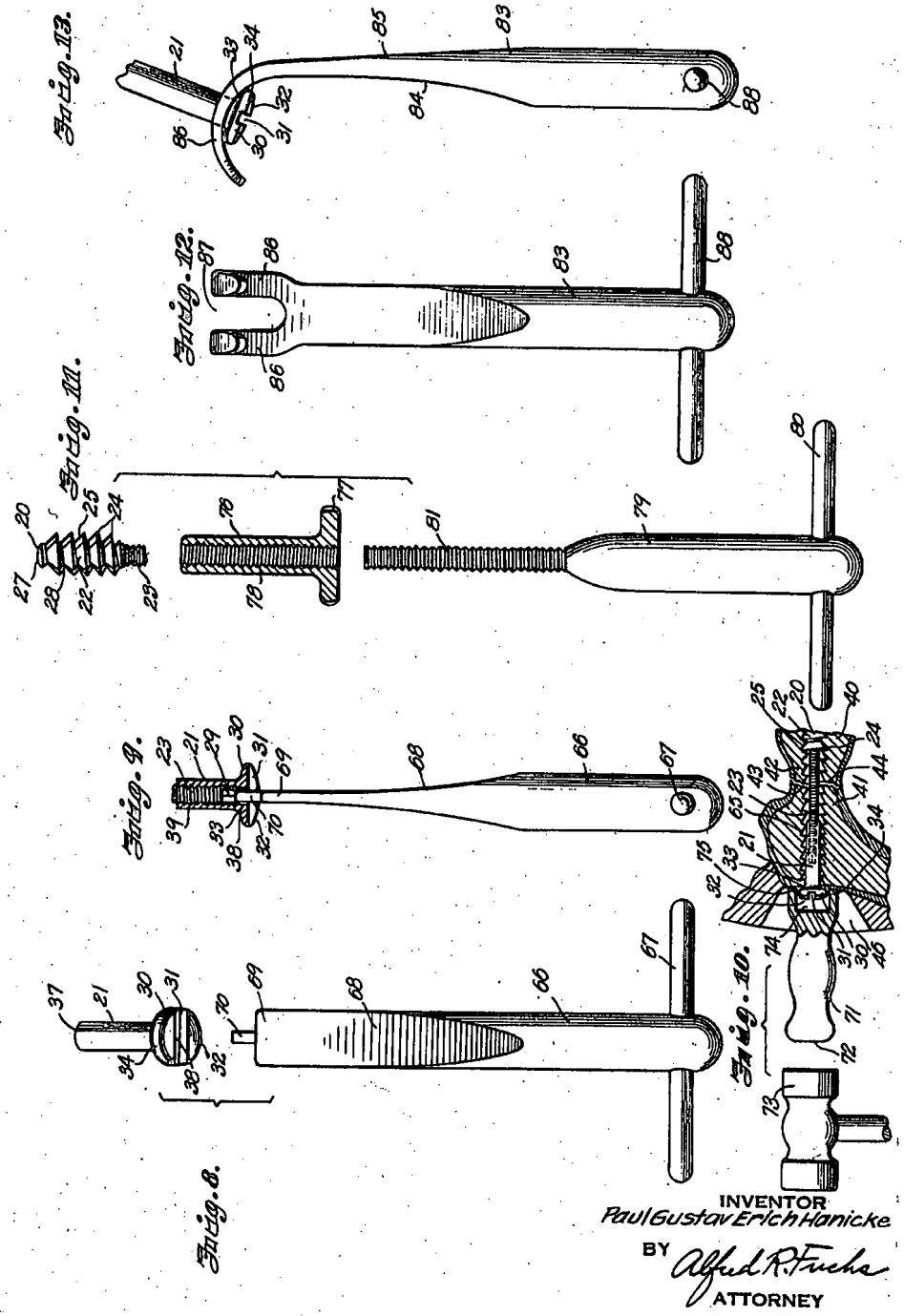

Fig. 13.

Fig. 12.

Fig. 11.

Fig. 9.

Fig. 10.

Fig. 8.

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UNITED STATES PATENT OFFICE

2,121,193

FRACTURE CLAMPING APPARATUS

Paul Gustav Erich Hanicke, Kansas City, Mo.

Application December 21, 1932, Serial No. 648,225
Renewed October 27, 1937

15 Claims. (Cl. 128—92)

My invention relates to apparatus for fixing reduced fractures of bones, and a new and improved method of fixing fractures of the neck of the femur or upper human leg bone.

The surgical neck of the femur being a rather weak connection between the shaft of the femur and the head portion thereof, which articulates with the acetabulum forming the hip joint, is subject to frequent and dangerous strains and shocks due to sudden falls or other sudden jerks to the hips. In elderly or old persons such sudden shocks or strains usually result in a fracture of the neck of the femur. This type of fracture has been treated by innumerable methods, but the results are not uniformly successful and are frequently very disappointing. The purpose of all the methods of treatment is to get a union of the fractured bone as soon as possible. This is only possible when both fracture sites are brought into close contact with each other and held firmly for a certain length of time. The proper union of the fractured bone also depends largely upon the constitution of the patient, and whether the bone cells regenerate and form new bone tissue around the fractured area. The leg has to be kept from contracting, from inward and outward rotation, as well as adduction and abduction and other dangerous movements, which usually cause complete dislocation and permanent deformity of the hip, resulting in what is known as a marked limb, etc. In order to immobilize both the hip and the leg, extensive plaster-of-Paris casts or splints or braces have been applied in previously used methods, but with a small number of good results, the possibility of any satisfactory result at all depending largely on the patient's condition. Treatment of such a fracture has also been tried by open reduction, which, due to the large incision necessary and the cutting of such a large amount of muscular tissue, as well as the method of fixation used after exposure of the bone, proves to be such a great shock to the patient as to be unsatisfactory in most cases.

It is a purpose of my invention to avoid the difficulties encountered by the previous methods, of attempting to firmly stabilize a fractured bone of the above mentioned character, by accurate means and facilities and to accomplish this without the use of the extensive plaster-of-Paris casts, and also without the necessity of a major operation causing shock to the patient and necessitating large incisions in the leg of the patient.

It is particularly a purpose of my invention to provide means for immobilizing the fractured area, that is, the head of the femur with part of the neck and the trochanteric section of the shaft with part of the neck, which means is located internally of the bone, and which is so constructed as to guarantee complete fixation and complete stabilization of the entire bone.

More particularly it is a purpose of my invention to provide a device for the internal fixation of the bones by the use of compression means, which holds them in close unity and exerts pressure on the fractured portions of the bone toward each other.

My improved apparatus also includes means to prevent rotation of the head of the femur around its axis relative to the neck of the femur to prevent separation and shifting of the fragments.

It is a further purpose of my invention to provide a device of the above mentioned character, which will permit of impaction of the bone after the compression means has been applied, and which will permit further adjustment thereof so as to press both parts of the bone tightly together after such impaction, and retain the same in such engagement for a sufficient length of time for a firm union of the parts to be accomplished.

One of the most important features of the invention is the provision of a combination anchoring device and coupling device and headed member cooperating therewith so that the anchoring member and the headed member operate to firmly clamp the parts of the bone together, said anchoring member comprising a portion having a coarse thread of steep pitch and a portion of smaller diameter than said coarsely threaded portion, having a fine thread of relatively much smaller pitch, the coarsely threaded portion being so constructed that it serves as a tap so as to provide a tapping anchoring means for threading into the bone that will be held firmly in place against axial movement after being threaded into position. By using the fine thread of much less steep pitch than the tapping anchoring portion for connecting the headed member with the anchoring member, said headed member may be threaded on the anchoring member without tending to turn the tapping anchoring portion thereof in the thread formed thereby in the bone, and thus the head of said headed member engaging the outer face of the femur at the incision will serve to draw this portion of the femur toward the head thereof to cause a close engagement between the fractured surfaces as said headed member is rotated by a

suitable tool to screw the same down on the anchoring member.

It is a further purpose of my invention to provide suitable means for preventing the turning down of the headed member on the anchoring member to too great a degree so as to cause a turning of the anchoring tapping portion of the anchoring member in the bone, and it is also a purpose of my invention to provide suitable means for limiting the turning of the anchoring member during the tapping operation beyond the point at which the thread has reached the extent it has been previously determined is the most desirable. This is determined by X-ray, and before the tapping is done an opening is drilled that will be coaxial with the thread that is subsequently tapped. The drilling means is also provided with suitable means for limiting the inward movement thereof, and my invention also contemplates the provision of suitable means for withdrawing the entire device, should the bone in which the thread is tapped be found to be of such a quality that the thread will not hold, or to remove the anchoring member after it has served its purpose, even though a break should occur in the finely threaded portion thereof, or in case such a break should occur in the finely threaded portion thereof during the operation of placing the same in position or during the operation of tightening down the threaded member thereon.

Other objects and advantages of my invention will appear as the description of the drawings proceeds. I desire to have it understood, however, that I do not intend to limit myself to the particular details shown or described, except as defined in the claims.

In the drawings:

Fig. 1 is a fragmentary sectional view through the upper end portion of the femur and the ilium, showing a fracture in the neck of the femur and showing a fragmentary portion of the flesh overlying the femur in section to indicate the size of the incision necessary to carry out my improved method of fixing the fracture, and showing my improved apparatus for fixing this and other types of fractures in position.

Fig. 2 is a view partly in longitudinal section and partly in elevation of my improved clamping and compressing means.

Fig. 3 is a face view of the head portion of the headed element of said clamping means.

Fig. 4 is an end view of the anchoring element as viewed from the entering end thereof.

Fig. 5 is a side elevation of the drill and stop means therefor used in carrying out my improved method.

Fig. 6 is a view partly in elevation and partly in section of the wrench used for tapping a thread with the anchoring member and inserting the anchoring member in position in the bone, and showing the stop element separate from the wrench.

Fig. 7 is a view in side elevation showing the wrench in engagement with the tapping anchoring member in the relationship which the same assume in the thread tapping operation of placing the anchoring member in position, and showing the stop means in engagement with the wrench.

Fig. 8 is a view similar to Fig. 6 of the tool of the nature of a screw driver used for threading the headed member on the anchoring member, and also for removing the headed member from the anchoring member, showing the headed member separated from said tool.

Fig. 9 is a view showing the screw driver-like tool in elevation as viewed substantially at right angles to Fig. 8, and showing the same in engagement with the stop means on the anchoring member for rendering the tool inoperative.

Fig. 10 is a fragmentary sectional view similar to Fig. 1, showing the impacting member in operative position and the hammer used in conjunction therewith.

Fig. 11 is a view partly in elevation and partly in longitudinal section of the apparatus for removing a broken anchoring member from the bone, and showing the elements thereof comprising the removing tool and the coupling member for engagement by said tool spaced from each other and spaced from the broken anchoring member with the parts in the relative position they would assume just prior to connection with each other.

Fig. 12 is a view in side elevation of a removing tool for removing the clamping means as a unit in case the anchoring member fails to hold, and

Fig. 13 is an elevational view taken at right angles to Fig. 12, showing the removing tool in engagement with the head of the headed element diagrammatically, the headed element being partly broken away.

Referring in detail to the drawings, my improved apparatus comprises a clamping or compressing device comprising a pair of elements, which are screw-threadedly connected together. One of said elements may be referred to as an anchoring element **20**, and the other as a headed element **21**. The anchoring element comprises a combined anchoring and tap portion **22** and a threaded stem portion **23**, the threaded stem portion **23** being of materially smaller diameter than the tap or anchoring portion **22**. The tap or anchoring portion **22**, as will be evident from Fig. 4, is made up of a plurality of spaced cutter blades **24**, which are spirally arranged and which have a steep pitch, and which are also spaced a substantial distance apart so that the same will cut a coarse thread of steep pitch.

In order to leave as much of the bone as possible the forward or entering faces of the cutter blades **24** are only inclined relative to the axis of the device as indicated at **25**, while the rear faces **26** of the cutter blades are substantially perpendicular to said axis at all points, the thread thus cut being a spiral that instead of being V-shaped in cross section, as is the case with an ordinary screw thread, have a cross section that is substantially only half of a V, that is, the rear face of the thread at any cross section through the same is substantially perpendicular to the axis of the thread, while the forward face is inclined in a similar manner to that in which both of the faces of a V-shaped thread would be.

The angularity of the inclined face to the substantially perpendicular face is made as acute as it can be so as to still have sufficient strength in the metal of the tapping portion to prevent breakage thereof. This leaves a maximum thickness of the bone between each turn of the thread cut in the bone and the next adjacent turn. The entering end of the anchoring member **20** is rounded, as at **27**, to provide a reduced cutting portion thereon gradually increasing in diameter from slightly greater than the shank portion **28** of the tap to the diameter of the cutter

blades 24. The stem portion 23 is also threaded, and as shown in Figs. 1, 2 and 7, it will be noted that this stem portion is materially longer than the anchoring portion 22 that comprises the tap or thread cutting portion. It will also be noted that the stem portion 23 is screw threaded with an ordinary screw thread that is of very slight pitch and is a very fine thread providing a large number of turns on the stem portion. The stem portion at the end of the member 20 opposite that provided with the tap portion 22, has a polygonal axial projection or head 29 thereon, which is smaller in diameter than the threaded stem portion 23 and may be of any suitable shape to engage with a suitable socket of similar shape on a wrench member to be described below, which is shown as being square.

Cooperating with the anchoring member 20 is the headed member 21, which has a tubular sleeve-like body portion, which is internally threaded with a thread corresponding in size and pitch to the thread provided on the stem 23, and which has the head 30 thereon, which is provided with a transverse slot 31 therein on the outer face thereof, and which has a rounded top face 32 and a curved wall portion 33 connecting with the sleeve-like body portion of said member 21 and a rounding peripheral edge 34 joining the top face 32 and the curved portion 33 in a smooth curve so that there are no sharp projections thereon. All edges are rounded even at the points where the bottom of the slot 31 joins the peripheral wall of the head, as shown at 35. The corner 37 at the junction of the side wall of the sleeve-like portion 21 and the end edge thereof is also rounding, these edges being all rounded to prevent all possibility of injury to the patient in the use of the device. An opening 38 is provided in the headed member, running from the internally threaded opening 39 in the sleeve-like member to the slot 31 so as to provide a passage between said threaded opening 39 and said slot 31.

Referring now to Fig. 1, it will be noted that a portion of the femur and ilium of the patient having the fractured neck portion of the femur is shown therein, and some of the surrounding flesh and bone, more or less diagrammatically, to indicate the manner in which my improved apparatus is used and for the explanation of the method of fixing the fracture devised by me. In said figure the head of the femur is indicated by the numeral 40, the socket portion of the ilium in which the head 40 operates is indicated at 41, and the broken neck portion is indicated by the numeral 42, the fractured faces of the bone or sites of the fracture are indicated by the numerals 43 and 44, the tissue and flesh overlying the femur at the point where the incision is made is indicated diagrammatically at 45, and the incision is shown at 46.

In carrying out the method the patient should be placed on an operating table, a fracture table of the Albey type being preferred. Both legs are abducted as much as possible and thoroughly inverted. Care has to be taken not to be guided by toeing in of the feet alone, but the patella or knee cap points markedly toward the inner side. This places the neck of the femur in a substantially horizontal position, which is of great value in maintaining directions in the subsequent steps of the method.

Inasmuch as the entire procedure is more or less blind working and is checked only by guiding wires and X-ray pictures that are made for this purpose, accuracy is highly essential to obtain a neat and clean result. The patient is placed on an all aluminum spica box with a curved X-ray cassette holder incorporated in the crotch post. The pelvic plate of the table above referred to is lowered sufficiently to allow the X-ray pictures to be taken, when the cassette must be placed under the hip, without moving the patient. The patient should not be moved for any reason after the first X-ray and the following X-ray pictures are taken. The lateral pictures to obtain the horizontal angle of the fractured neck of the femur and its position are taken diagonally through the hip from above the crest of the ilium toward the perineum. The patient may have to be manipulated and the fracture reduced to its normal position by manipulation thereof during observation by means of the fluoroscope. Either a local or straight anaesthetic can be given. An incision of from 2 to 3 inches is made taking the gluteal ridge as a guide. Starting 1 inch below this point and ½ inch from the anterior margin of the femur a guide wire, known as a Kirchner wire, is drilled into the femur in a direct transverse plane toward the head of the femur, the length of the wire being such that it extends well into the head portion 40 and will project a substantial distance outwardly from the exposed face 47 of the femur at the incision 46, this wire being indicated by the numeral 48.

Another wire 49 of substantially the same length as the wire 48 is then drilled in a substantially parallel direction to the wire 48 at a point about 1 inch below the first wire, these wires 48 and 49 drilling their own openings in a well known manner. The wires 48 and 49 are of such length that they project about 1½ inches outwardly beyond the exposed face of the bone. A small marker may be attached to each wire to identify the same in the X-ray pictures, which are taken subsequent to the insertion of these wires. Anterior, posterior and lateral X-ray pictures are now taken. Should the wires 48 and 49 be found to be in unsatisfactory places after taking these X-ray pictures, new wires are used and the others withdrawn. The wires 48 and 49 serve as line markers and guides and as pins for temporarily fixing the head of the femur relative to the shaft thereof so as to prevent turning of the head around on its own axis when the apparatus for clamping the two parts of the fractured neck of the femur is inserted. After the exact angle of the neck and the exact location of the fracture are determined from these X-ray pictures, the length of the neck of the femur, that is from about ⅜ inch inwardly from the anterior face 36 of the head 40 to the outer face 47 of the cortex, is then measured from these pictures, the distortion being calculated carefully so that the exact length thereof is positively determined. A chart of magnification is preferably used for this purpose. In this manner the distance that the drill, which is to be used to provide the opening for the clamping apparatus, is to enter the bone can be positively determined, so that the opening that is drilled will enter sufficiently into the head of the femur to firmly anchor the apparatus in position, but will not approach dangerously close to the anterior face 36 of said head portion.

For drilling this opening or passage the drill 50 is used. This drill is an ordinary metal drill, such as is used for aluminum having a dove-tail point 51. The drill preferably is of a size to drill

a hole ¼ inch in diameter and is provided with a stop member, which is made up of a tapered sleeve-like member 52, having a knurled flange 53 thereon, which member is slotted at a plurality of points, as indicated at 54, and which is externally threaded to be engaged by the internal threads on the knurled nut 55.

It will be obvious that the stop member 52 can be adjusted to any position on the drill 50 desired, and the nut 55 screwed up toward the head 53 to firmly clamp the stop member 52 in adjusted position. The stop member 52 is placed in a position on the drill 50 such that the hole drilled thereby will be of a depth $\frac{1}{8}$ of an inch greater than the distance from the outer face 47 of the femur at the incision to the extreme forward end of the tap member 20 when in final position in the bone. This adjustment is made in order that the anchoring screw or tap portion of the anchoring member 20 at its forward end or entering end 27 will not be inserted to the end of the hole.

In drilling the main hole with the drill 50 the drill is guided by the projecting wires 48 and 49, and is directed toward the presumed location of the head of the femur as determined from the X-ray pictures. A drill with a dove-tailed center point is preferably used to prevent splintering of the bone. It may be either driven by hand or electrically, the speed preferably being about 500 revolutions per minute. The drill is pulled out gently as soon as the control stop reaches the outer face of the bone 47.

The anchoring member 20 is next inserted in position. This is done by means of a wrench 56 having a cross piece 57 thereon serving as a handle, the handle portion being preferably made of round rod and has rounded ends, while the shank portion of the wrench 56 is also made of round rod or similar material and has a rounded end at 58, and is gradually tapered at 59 to the diameter of the reduced forward end portion 60 thereof, which is provided with a socket 61 therein, which has a polygonal bottom portion 62 corresponding in shape to that of the head portion or projection 29 on the anchor member 20.

The portion 60 of the shank of the wrench is made of substantially the same diameter as the drill 50 so as to be freely rotatable in the opening drilled in the bone by means of the drill 50. The control stop 52, previously described, is again utilized to limit the inward movement of the tap and wrench at the desired point so that the stop 52 will engage the outer face 47 of the exposed portion of the bone at the incision when the anchoring member has reached the desired final position therefor, this being determined by previous measurement, the stop being preferably set on the reduced forward portion 60 of the shank of the wrench in such a position that with the projection or head 29 seated in the polygonal bottom 62 of the socket 61 the distance from the forward face of the stop 52 to the extreme forward or entering end of the tap member on the anchoring member 20 will be slightly less, preferably about $\frac{1}{8}$ of an inch less, than the distance from the forward end of the drill to said stop member 52.

The opening or passage drilled by the drill 50 is indicated by the numeral 63 in Fig. 1 and is of uniform size throughout, except for the small projection 64 formed at the forward end thereof or inner end thereof by the dove-tail point 51 on the drill. In inserting the anchor member 20 in the bone the anchor member 20 is pushed into the socket of the wrench and lodges itself in the polygonal portion 62 thereof firmly. This makes the anchor member and the socket wrench operate substantially as a unit, which can be handled readily with one hand. Care has to be taken to start the anchoring member 20 straight into the bone and it can be readily guided by the two guide wires, or Kirchner wires 48 and 49, and the direction determined therefrom to maintain the correct angle for the location of the head of the femur as determined from the X-ray pictures.

The cutting teeth 24 of the tap portion of the anchoring member 20 will cut a thread in the wall of the previously drilled passage 63 in the bone, this thread being indicated by the numeral 65. The extent of the thread tapping operation is determined by the position of the stop member 52 and the position of the anchor member 20 is also determined thereby, as the inward movement of this member and the extent of the thread cut thereby is limited by the engagement of the stop member 52 with the exposed face 47 of the bone. A screw threaded connection having thus been established between the bone and the anchoring member 20, the wrench can be readily removed by merely pulling outwardly thereon.

The headed member or cap member 21 is next inserted. The external diameter of the tubular sleeve-like portion of the member 21 is such that it will readily pass through the opening or passage 63 made by the drill without any danger of binding, and while the thread 65 extends over the entire portion of the opening that has been drilled in which the tubular portion of the member 21 is located when in its final position, this is immaterial as far as the operation of the apparatus is concerned. The headed member 21 is inserted by hand first, making contact with the first few turns of the threaded stem portion 23 of the member 20. This is done by hand so that the operator can feel the engagement of the threads to make sure that the internal thread on the member 21 is engaging with the external thread on the member 23.

A tool for turning the headed member 21, which tool is shown in Figs. 8 and 9, is next utilized. Said tool is provided with a shank portion 66, which is substantially circular in cross section and which has a handle portion 67 also made of material substantially circular in cross section, and the ends of the handle portion 67 and of the shank portion 66 are preferably rounded in a similar manner to that of the wrench 56. The shank portion 66 is provided with flattened converging faces 68 that form a substantially flat narrow blade portion 69 similar to that of a screw driver, from which a rounded projection 70 extends in a forward direction, the diameter of the projection 70 being slightly less than that of the opening 38 in the headed member 21, and the thickness and width of the blade portion 68 being such as to nicely fit the slot 31 in the head 30.

The relative position of the member 21 and the screw driver-like tool is shown in Fig. 8 just prior to insertion of the tool into engagement with the head of the member 21. With the forward edge of the blade 68 seated in the bottom of the slot 31 and the projection 70 in the opening 38 and extending into the passage of larger diameter within the member 21 having the internal threads 39, the tool is in position for rotation of the sleeve-like headed member 21, and the length of the stem portion 23 and of the tubular portion of the member 21 is preferably such that the head 30 will engage the outer surface 47 of

the bone at the incision 46, considerably before the internal thread on the member 21 reaches the end of the external thread on the stem 23. Thus the head 30 will exert a clamping action to draw the surfaces or sites 43 and 44 toward each other and substantially into engagement a considerable period of time before the sleeve-like member 21 has been screwed down tight on the member 23.

Should an error be made in calculations and should the person carrying out the method tighten the sleeve-like member down on the stem 23 until it reaches substantially the limit of rotation thereon, the actual reaching of this limit of rotation is prevented due to the fact that the polygonal projection 29 on the stem 23 will reach such a position in the member 21 that it will engage with the forward projection 70 on the tool to force the same out of the slot 31, as shown in Fig. 9, so as to disengage the blade 69 of the tool from the slot 31 to warn the operator that further rotation of the sleeve-like headed member 21 must not be attempted, as such further rotation might cause the members 20 and 21 to turn together and the thread to be cut deeper than intended, possibly causing breakage of the member 20 due to the fact that the tap-like portion 22 thereof will strike the end of the drilled opening 63.

While it is possible that the two fractured surfaces 43 and 44 can be drawn into such intimate contact by means of the headed member 21 and the anchoring member 20 that no further steps may be necessary in the method of fixing the fracture, preferably the bone is impacted in the manner shown in Fig. 10. After the clamping member is in position, as shown in Fig. 1, the wires 47 and 49 are withdrawn and the impactor 71 having a head portion 72 thereon, which is adapted to be engaged by a hammer 73, and having a socket 74, which is adapted to loosely receive the head 30 of the headed member 21, is placed in the incision with the annular substantially flat face 75 thereon in engagement with the outer surface 47 of the bone, surrounding the headed member 30, and the bone is impacted by means of said impactor 71 and the hammer 73 to force the broken surfaces 43 and 44 into snug engagement. After such impacting has been done the internally screw-threaded headed member 21 is tightened up on the externally threaded member 23 of the member 20, to take up the slack thus created in the clamping means, until the head 30 is again in firm engagement with the outer surface 47 of the bone at the incision. This impacting and tightening up of the clamping member may be repeated, should it be found necessary.

This completes the operation and the clamping means remains in position for the required length of time for the surfaces 43 and 44 of the bone to knit together. The members 20 and 21 are made out of stainless steel, and the screw driver-like tool and the wrench can also be made out of stainless steel if desired, although the thing of greatest importance is that the clamping member, which remains in the bone for a considerable period of time, be made of such non-corrosive material. When the two broken portions of the neck of the femur have again firmly grown together the clamping means is removed by first unscrewing the headed member 21, after which the wrench 56 can be utilized to unscrew the screw-threaded member 20 from the screw-threaded opening in the bone by reverse rotation thereof, the screw thread being a right-handed thread so that the rotation of the tool during the thread tapping action of said member 20 is in a clockwise direction, while during the removal the rotation of the tool is in a counter-clockwise direction.

It might sometime happen that during the removal of the anchoring member 20 from the bone, or during the insertion thereof, breakage thereof occurs in the relatively small finely threaded portion 23, and in Fig. 11 such a broken member 20 is shown, together with the apparatus for removing the same from the bone, said means comprising a sleeve 76 having a knurled flange 77 on one end thereof, and having an internally screw-threaded passage 78 extending entirely therethrough, said screw-threaded passage 79 being of the same pitch and size as the thread on the externally threaded stem portion 23 of the member 20, and a wrench-like member 79 having a transversely extending handle member 80 and an externally screw-threaded elongated shank portion 81 cooperates with the sleeve-like member 76 to remove the member 20 from the bone.

The sleeve-like member 76 is turned down on the externally threaded portion 23 of the member 20 until it reaches the end of the thread on said externally threaded portion 23, which makes the sleeve-like member 76 substantially a unit with the member 20. The member 79 is then screwed down through the internally threaded portion 79 of the sleeve-like member 76 until it engages with the broken end 82 of the member 20, thus further exerting a clamping action to secure the members 79, 76 and 20 together. The member 20 can then be rotated in a direction to screw the same out of the bone by means of the handle 80 on the wrench-like member 79.

Sometimes the bone is of such a quality that a thread tapped therein will not hold the anchoring member in fixed position and when this is the case the only thing that can be done is to remove the entire device comprising the anchoring member 20 and the sleeve-like member 21. An extracting tool for this purpose is shown, which has a shank 83, which is provided with converging faces 84 and 85 to provide a wide end thereon, which is bifurcated to provide a pair of curved hooks 86 with a slot 87 therebetween of sufficient size to receive the tubular body portion of the member 21 with the head 30 seated on the concave side of the curved portions 86. This is shown in Fig. 13. The curved hook-like members can be inserted under the head 30 by unscrewing the sleeve-like member 21 sufficiently that such insertion can be made between the outer face of the bone and the head 30 and the entire clamping means comprising the members 20 and 21 can be withdrawn by an outward pull on the extracting tool by means of the cross handle 88.

What I claim is:—

1. An apparatus of the character described comprising an elongated member having an elongated thread tapping holding portion of substantially uniform diameter from end to end and a reduced threaded portion thereon and a tubular, headed member having a threaded portion adapted to engage the threaded portion of said elongated member.

2. An apparatus of the character described comprising an elongated member having a thread tapping holding portion, a reduced threaded portion extending endwise from one end of said thread tapping holding portion and wrench receiving means formed on the end

thereof and a tubular, headed member having a threaded portion adapted to engage the threaded portion of said elongated member and receive said wrench receiving means therein.

3. An apparatus of the character described comprising an elongated member having a thread tapping holding portion and a reduced threaded portion and a tubular, headed member having a threaded portion adapted to engage the threaded portion of said elongated member, and having a transverse groove in the head thereof intersecting the passage in said tubular member.

4. An apparatus of the character described comprising an elongated member having a thread tapping holding portion, a reduced threaded portion and wrench receiving means thereon and a tubular, headed member having a threaded portion adapted to engage the threaded portion of said elongated member, and having a transverse groove in the head thereof intersecting the passage in said tubular member.

5. Means for clamping the broken surfaces of a bone in intimate contact comprising a member having means thereon for anchoring itself against longitudinal movement in said bone at one side of the break therein and a headed member mounted for longitudinal movement in an opening in said bone on the other side of said break with the head thereon outermost and engaging the outer surface of said bone, said members being telescopically related and having cooperating threaded means thereon adapted to draw said members together.

6. An apparatus of the character described comprising an anchoring member having a tap portion provided with a plurality of spirally arranged cutter blades each having an inclined forward face and a rear face substantially perpendicular to the axis of said tap portion, said tap portion being of greater diameter than any other portion of said anchoring member, a threaded stem portion of smaller diameter than said tap portion and a polygonal formation on said stem portion adapted to be engaged by a wrench.

7. An apparatus of the character described comprising an anchoring member having a tap portion provided with a plurality of spirally arranged cutter blades each having an inclined forward face and a rear face substantially perpendicular to the axis of said tap portion, said blades being widely spaced axially of said tap portion and being of steep pitch, said tap portion being of greater diameter than any other portion of said anchoring member, a threaded stem portion of smaller diameter than said tap portion, the thread on said stem portion being much finer and of much less pitch than the thread formed by said tap portion and a polygonal formation on said stem portion adapted to be engaged by a wrench.

8. An apparatus of the character described comprising an anchoring member having a tap portion provided with a plurality of spirally arranged cutter blades each having an inclined forward face and a rear face substantially perpendicular to the axis of said tap portion, a threaded stem portion of smaller diameter than said tap portion and a polygonal formation on said stem portion adapted to be engaged by a wrench, and an internally threaded sleeve-like member having an axial opening through the same from end to end, and having a head on one end thereof, the internally threaded portion of said sleeve-like member engaging the threaded stem portion on said anchoring member.

9. An apparatus of the character described comprising an anchoring member having a tap portion provided with a plurality of spirally arranged cutter blades each having an inclined forward face and a rear face substantially perpendicular to said axis of said tap portion, said blades being widely spaced axially of said tap portion and being of steep pitch, a threaded stem portion of smaller diameter than said tap portion, the thread on said stem portion being much finer and of much less pitch than the thread formed by said tap portion and a polygonal formation on said stem portion adapted to be engaged by a wrench, and an internally threaded sleeve-like member having an axial opening through the same from end to end, and having a head on one end thereof, the internally threaded portion of said sleeve-like member engaging the threaded stem portion on said anchoring member, said head having a transverse groove therein intersecting the axial passage in said sleeve-like member.

10. Apparatus for clamping two portions of a fractured bone together comprising an anchoring member having a tap portion, a threaded stem portion of smaller diameter than said tap portion and a polygonal formation on said stem portion, and a wrench engaging said polygonal formation, said wrench having an elongated tubular shank portion of substantially uniform diameter smaller than said tap portion embracing said threaded portion and a stop member of larger diameter than said tap portion adjustable on said shank portion to limit the forward movement of said tap portion in the bone.

11. An apparatus of the character described comprising an anchoring member having a coarsely threaded portion of steep pitch adapted to tap its own thread in a bone, a finely threaded stem portion of smaller diameter than said coarsely threaded portion, and a polygonal end portion of smaller diameter than said finely threaded portion, and a sleeve-like headed member having an axial passage therethrough threaded to receive said stem portion, said head having a tool receiving slot therein, said stem portion being of such length relative to said sleeve-like member that said polygonal end will reach said slot before said sleeve-like member has been screwed onto said stem to the limit of the thread thereon.

12. An apparatus of the character described comprising an anchoring member having a coarsely threaded portion of steep pitch adapted to tap its own thread in a bone, a finely threaded stem portion of smaller diameter than said coarsely threaded portion, and a polygonal end portion of smaller diameter than said finely threaded portion, a sleeve-like headed member having an axial passage therethrough threaded to receive said stem portion, said head having a tool receiving slot therein, and a tool having a flat, narrow blade adapted to engage said slot to turn said sleeve-like member and provided with a central forward projection, entering the axial passage in said sleeve-like member, said stem portion being of such length relative to said sleeve-like member that said polygonal end will engage said projection to disengage said blade from said slot before said sleeve-like member has been screwed onto said stem to the limit of the thread thereon.

13. The method of clamping together the frac-

tured faces of a bone of such character as to be capable of holding a threaded member therein, comprising making a small incision adjacent a readily accessible portion of the bone on one side of the fracture, aligning the fractured portions of the bone, inserting a pair of members through said portion of the bone across said fracture and into the portion of the bone on the other side of said fracture to hold said portions of the bone against relative rotation, drilling a hole from said incision into said bone across and a substantial distance beyond said fracture, inserting a self-tapping anchoring member into said opening to screw-threadedly anchor said member in the portion of the bone remote from said incision, said member being adapted to have screw-threaded engagement with a headed member, inserting a headed member into said opening and threading the same onto said anchoring member to draw said head down on the outer surface of said bone at said incision and draw the fractured surfaces of the bone toward each other.

14. The method of clamping together the fractured faces of a bone of such character as to be capable of holding a threaded member therein, comprising making a small incision adjacent a readily accessible portion of the bone on one side of the fracture, aligning the fractured portions of the bone, inserting a pair of members through said portion of the bone across said fracture and into the portion of the bone on the other side of said fracture to hold said portions of the bone against relative rotation, drilling a hole from said incision into said bone across and a substantial distance beyond said fracture, inserting a self-tapping anchoring member into said opening to screw-threadedly anchor said member in the portion of the bone remote from said incision, said member being adapted to have screw-threaded engagement with a headed member, inserting a headed member into said opening and threading the same onto said anchoring member to draw said head down on the outer surface of said bone at said incision and draw the fractured surfaces of the bone toward each other, impacting said bone at said incision around said head, and screwing said headed member further onto said anchoring member to draw up the slack after impaction of said bone.

15. An apparatus of the character described comprising an elongated member having a thread tapping holding portion and a threaded portion thereon and a tubular, headed member having an elongated tubular threaded shank portion of smaller external diameter than said thread tapping holding portion adapted to engage the threaded portion of said elongated member.

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Set Items Postings Description
S1 35653 92235 S (AIM OR AIMING OR TARGET? OR INSERT? OR ALIGN? OR PLACER? OR PLACEMENT? OR INSTALL?)()(GUIDE? ? OR JIG OR JIGS OR MEMBER? OR APPARATUS? OR DEVICE? OR TOOL? ? OR APPLIANCE? OR IMPLEMENT? OR INSTRUMENT? OR HOLE? ? OR SLEEV? OR CYLINDER? OR TUBE?)
S2 1475 3915 S GUIDING?()(JIG OR JIGS OR MEMBER? OR APPARATUS? OR DEVICE? OR TOOL? ? OR APPLIANCE? OR IMPLEMENT? OR INSTRUMENT? OR HOLE? ? OR SLEEV? OR CYLINDER? OR TUBE?)
S3 4456 8288 S GUIDING()(CHANNEL? OR GROOV? OR SLOT? OR GUTTER? OR TRENCH? OR FURROW? OR PASSAGE? OR PIPE?) OR ALIGNER?
S4 119624 290230 S (DRIVER OR DRIVING? OR TORX OR TORQUE OR ALLEN OR HEX OR FASTEN? OR TIGHTEN? OR INSTALL? OR PHILLIPS OR FLAT()HEAD OR FLATHEAD OR HEXAGON?)(2N)(TOOL? ? OR WRENCH? OR JIG OR JIGS OR MEMBER? OR APPARATUS? OR DEVICE? OR APPLIANCE? OR IMPLEMENT? OR INSTRUMENT?)
S5 55303 83516 S SCREWDRIVER? OR WRENCH? OR (SCREW? OR BRAD? ? OR BOLT? ? OR PIN)()DRIVER?
S6 7231 32695 S S1:S3(15N)S4:S5
S7 688 14167 S FASTENER? OR PIN OR PINS OR SCREW OR SCREWS OR BRAD OR BRADS OR BOLT? ? OR ADJUST?R? OR ADJUST?()MECHANISM? OR DRILLBIT? OR DRILL()(BIT OR BITS)
S8 990 5380 S ELONGATE?()MEMBER? OR NAIL? ? OR ANCHOR? OR FIXATOR? OR FIXATING? OR THREADED? OR NAIL? OR BRAD? ? OR RIVET? OR STUD? ?
S9 328 5496 S TACK? ? OR FIXATION OR FIXATE? OR FASTENER?
S10 43 213 S (HELIC? OR HELIX? OR COIL? OR SPIRAL? OR THREAD?)(2N)(DEVICE? OR APPARATUS? OR TOOL? ?)
S11 320 581 S RETAINER? OR SECURING OR SECURER? OR PEG? ? OR STAKE? OR ATTACHER?
S12 38 204 S (THREAD? OR HELIC? OR HELIX? OR COIL? OR SPIRAL?)(2N)(CONNECT?R? OR ROD OR RODS OR POLE? OR SLEEV? OR SHEATH? OR SHAFT? OR NAIL? OR TACK? ? OR ANCHOR? OR RETAINER? OR PEG OR PEGS OR STAKE?)
S13 866 10430 S SCREW? OR BRAD? ? OR RIVET? OR PIN OR PINS OR CONNECT?R? OR FIXAT?R?
S14 2604 7554 S COMBINED OR INTEGRAL OR INTEGRATED OR COMBINATION OR ALL(2W)ONE OR REVERSIBLE OR REVERS? OR FLIPPING OR TURN?()OVER OR COMPOUND
S15 3259 6002 S UNITED OR SELFCONTAIN? OR SELF()CONTAIN? OR UNITARY? OR MONOPIECE? OR (FLIP? OR SWITCH?)()(END OR ENDS OR POSITION? OR ORIENTATION?)
S16 1113 2750 S (ONE OR MONO OR UNI)()PIECE? OR INCORPORAT? OR (2 OR TWO)()WAY OR TWOWAY OR (PIVOT? OR SWING? OR SLUE?)()AROUND
S17 885 4530 S PLATE? OR PANEL? OR FLAT()PIECE? OR BRACKET? OR PLANK? OR PANE? ? OR BASEPLATE?
S18 27 58 S METALPLATE? OR METALSHEET? OR METAL?()SHEET? OR BACKPLATE? OR FACEPLATE?
S19 596 2328 S MEDICAL? OR SURGER? OR SURGEON? OR PHYSICIAN? OR DOCTOR? OR CHIRURG? OR ORTHOPED? OR ORTHOPAED? OR ORTHO()(PEDIC? OR PAEDIC?) OR TREPHIN?
S20 46 84 S OSTE? OR OSSO? OR OSTO? OR OSSE? OR ENDOSTE? OR PERIOSTE?
S21 119 332 S BONE? ? OR ORTHOPED? OR ORTHOPAED? OR OSSEOUS? OR SKELET?
S22 6147 90949 S METHOD? OR SYSTEM?? OR PROCESS?? OR PROCEDUR? OR TECHNIQUE? OR MANNER? OR MODE? OR MEANS OR ROUTINE? OR PROTOCOL?
S23 0 0 S AU=(ELLIOTT E? OR ELLIOTT, E? OR ELLIOTT M? OR ELLIOTT, M?)
S24 0 0 S ELLIOTT(2N)(ERIC OR MATT OR MATTHEW)
S25 655 5768 S S6 AND S19:S21
S26 337 6320 S S25 AND S22(10N)(S1:S5 OR S7:S13 OR S19:S21)
S27 2186 26080 S S6 AND S22(10N)(S1:S5 OR S7:S13)
S28 176 5745 S S27 AND (S1:S3 AND S4:S5)(20N)S14:S16
S29 496 11966 S S26 OR S28
S30 45 4891 S S29 AND S17:S18(10N)(S1:S5 OR S7:S13)
S31 496 16258 S S29:S30
S32 426 15389 S S31 AND PY=1970:2004
S33 428 14992 S S31 NOT PY=2005:2007
S34 428 24336 S S32:S33
S35 319 12165 RD (unique items)

S36 212 8662 S S35 AND S19:S21
S37 216 14243 S S34 NOT S36
S38 169 5469 RD (unique items)
S39 70 2501 S S38 AND S1:S5(10N)S14:S16
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[File 95] **TEME-Technology & Management** 1989-2007/Jul W3

[File 99] **Wilson Appl. Sci & Tech Abs** 1983-2007/Jun

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36/5,K/19 (Item 18 from file: 5) Links
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16098466 **Biosis No.:** 200100270305
Anterior lateral spine cage-plate fixation device and technique

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Author Address: Bordeaux, France**France
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Patent Number: US 6156037 **Patent Date Granted:** December 05, 2000 20001205 **Patent Classification:** 606-61 **Patent Assignee:** SDGI Holdings, Inc. **Patent Country:** USA
ISSN: 0098-1133
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Abstract: An interbody fusion cage has an externally **threaded** stem projecting from a domed outer end. A contoured **plate** is provided with an aperture receivable on the stem. The stem threads receive a nut to fix the **plate** to the cage. **Bone screws anchor** the **plate** to vertebral bodies. A hemispherical surface on the **plate** and surrounding the stem-receiving aperture and bearing on the dome, accommodates universal angulation of the **plate** relative to the cage. In addition to a cage **installation tool**, there is a **plate installation tool** assembly including a cage installer, a **plate** holder, a nut holder and cage **adjuster**, a nut driver, and a **plate** holding prong controller.

DESCRIPTORS:
Major Concepts: Equipment, Apparatus, Devices and Instrumentation; **Orthopedics**-- Human Medicine, **Medical** Sciences; Methods and Techniques
Methods & Equipment: anterior lateral spine cage-**plate fixation** device-- **medical** equipment; anterior lateral spine cage-**plate fixation technique**--surgical method
Concept Codes:
00532 General biology - Miscellaneous
Anterior lateral spine cage-plate fixation device and technique
2000

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DESCRIPTORS:
Major Concepts: ...Orthopedics--... ...Human Medicine, Medical Sciences
Methods & Equipment: anterior lateral spine cage-plate fixation device... ...medical equipment... ...anterior lateral spine cage-plate fixation technique--

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United States Patent [19]

LeHuec et al.

[11] Patent Number: 6,156,037

[45] Date of Patent: Dec. 5, 2000

[54] **ANTERIOR LATERAL SPINE CAGE-PLATE FIXATION DEVICE AND TECHNIQUE**

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[73] Assignee: **SDGI Holdings, Inc.**, Memphis, Tenn.

[21] Appl. No.: **09/181,362**

[22] Filed: **Oct. 28, 1998**

[51] **Int. Cl.**[7] **A61B 17/56**

[52] **U.S. Cl.** **606/61**; 606/69; 606/72

[58] **Field of Search** 606/61, 69, 72, 606/73

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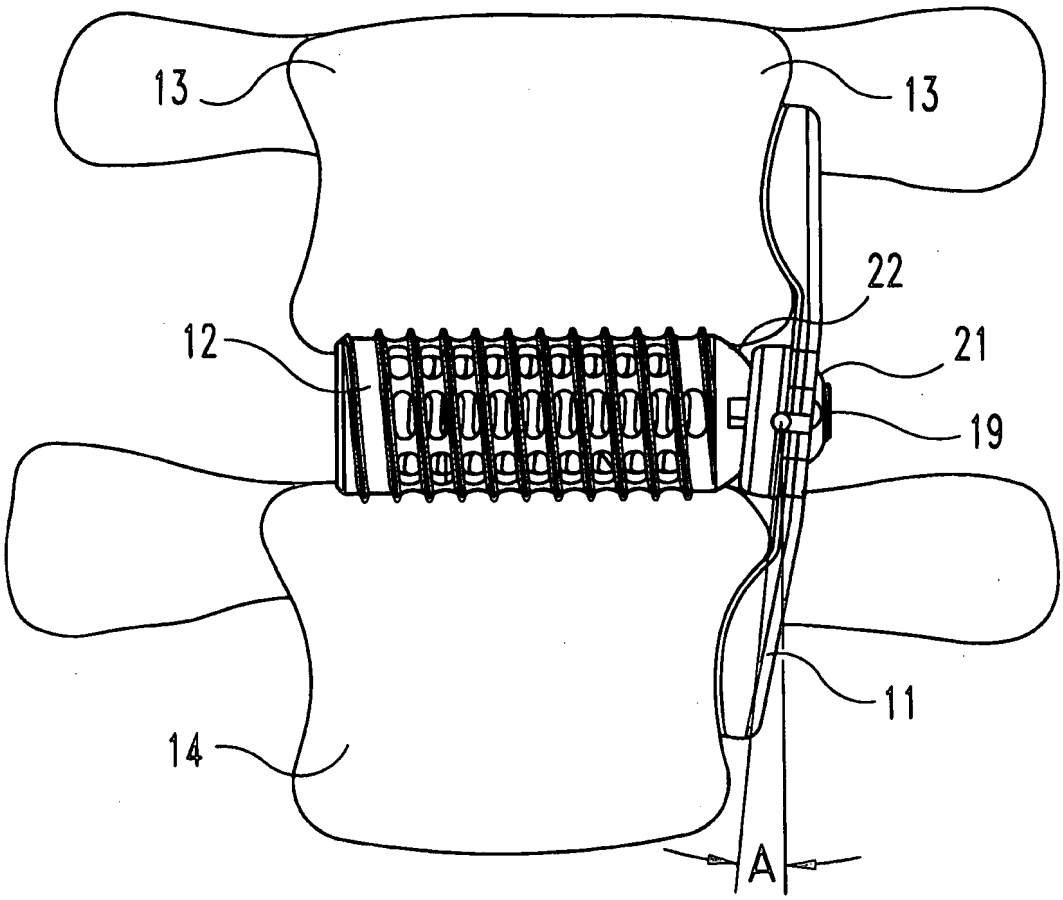
Primary Examiner—Gary Jackson
Assistant Examiner—Duphna Shai
Attorney, Agent, or Firm—Woodard, Emhardt, Naughton Moriarty & McNett

[57] **ABSTRACT**

An interbody fusion cage has an externally threaded stem projecting from a domed outer end. A contoured plate is provided with an aperture receivable on the stem. The stem threads receive a nut to fix the plate to the cage. Bone screws anchor the plate to vertebral bodies. A hemispherical surface on the plate and surrounding the stem-receiving aperture and bearing on the dome, accommodates universal angulation of the plate relative to the cage. In addition to a cage installation tool, there is a plate installation tool assembly including a cage installer, a plate holder, a nut holder and cage adjuster, a nut driver, and a plate holding prong controller.

36 Claims, 7 Drawing Sheets



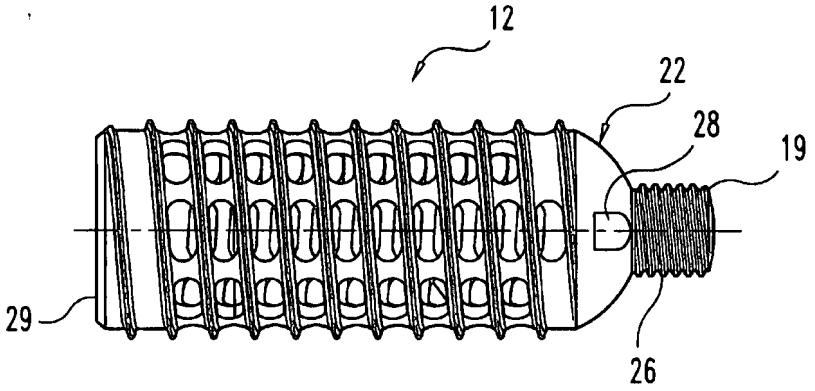


Fig. 3

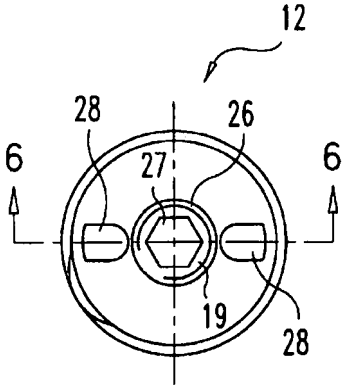


Fig. 4

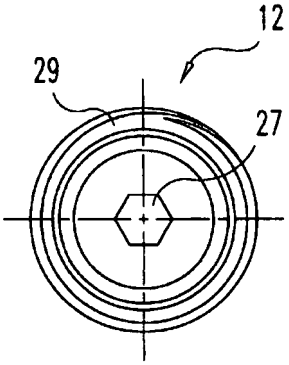


Fig. 5

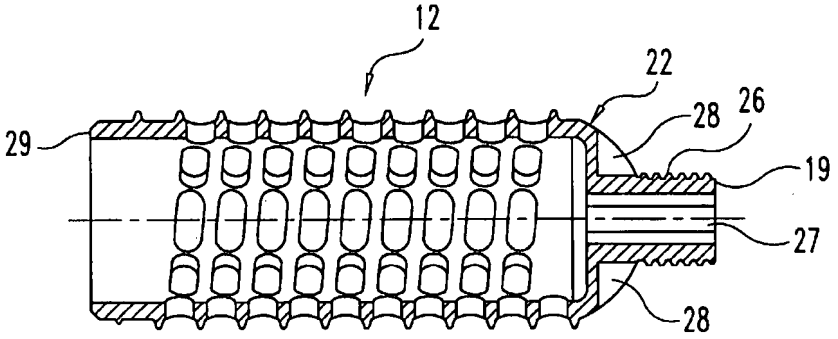


Fig. 6

Fig. 9

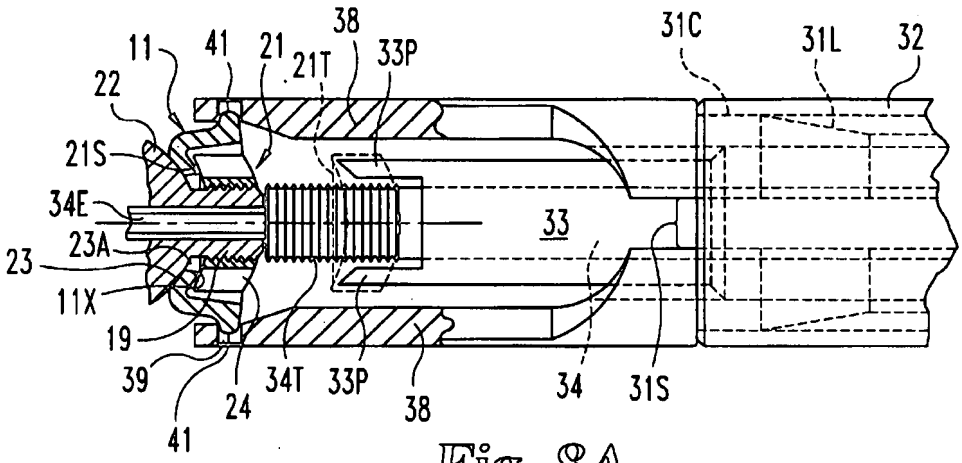


Fig. 8A

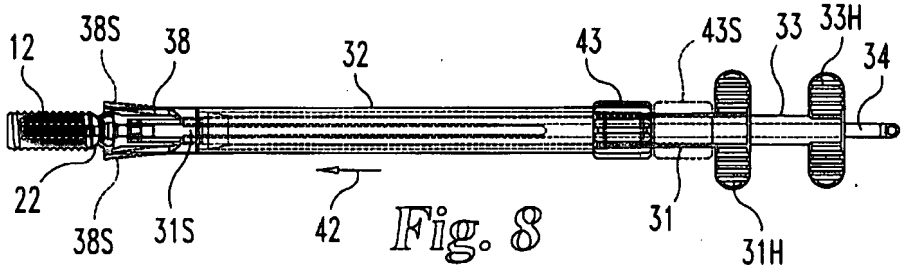


Fig. 8

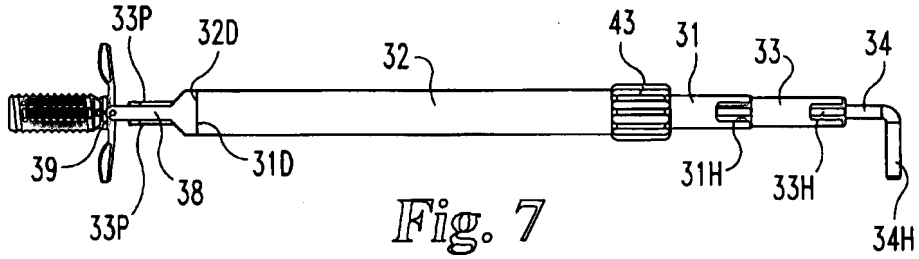


Fig. 7

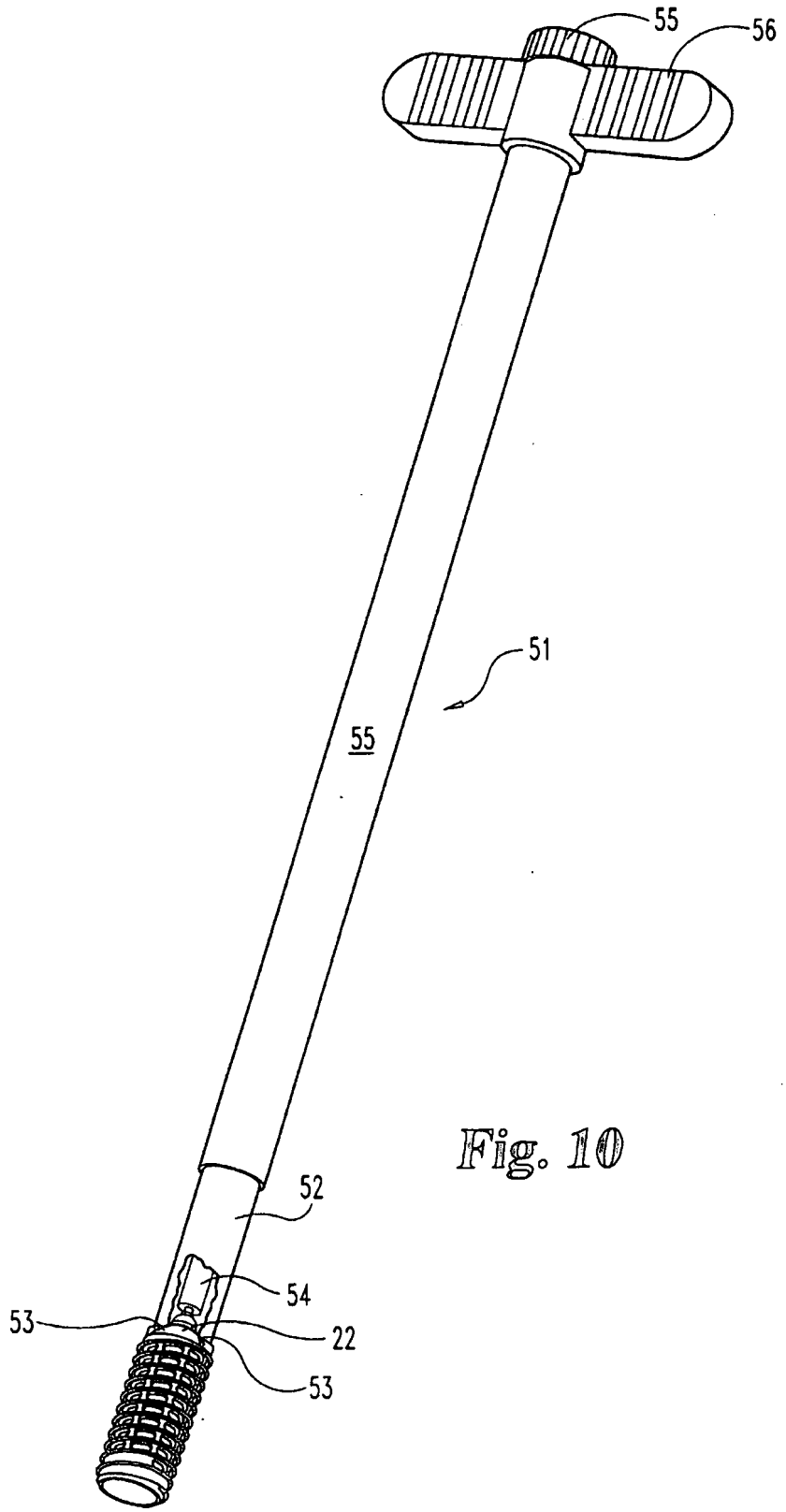


Fig. 10

15), one on each side of the plate 11 and integral with the plate, to permit pivoting of the plate from the inline position shown in FIGS. 11 and 12, to the transverse position shown in FIGS. 1, 2 and 7 through 9. The diameter of the plate holder steps down at shoulder 31D from a maximum diameter to a cylindrical surface 31C and then a conical surface 31L to the diameter extending out to the T-handle 31H. The plate holder, being slotted at 31S is made so that the prongs 38 are normally spread as at the dotted lines 38S (FIG. 8) for clearance of the pins 41 on the plate to enable insertion of the plate into the holder. Then the pins can be received in the holes 39 in the prongs when the distal end of the plate holder and prongs are constricted to the solid line illustration. This is done by moving the constrictor tube 32 in the direction of arrow 42, relative to the plate holder 31, whereupon the distal edge 32D of the constrictor tube operates on the conical surface 31L of the plate holder to drive the prongs 38 toward each other and thereby receive the pivot pins 41 of the plate in prong holes 39. Then the plate 11 can be pivoted to the inline introduction position on the plate holder wherein the longitudinal axis 11L (FIGS. 11 and 15) of the plate is colinear with the longitudinal axis of the plate holder 31. Knob 43 which is longitudinally confined on the constrictor tube 32, but rotatable thereon, is internally threaded for reception on an externally threaded portion 31E of the plate holder to facilitate the relative movement lengthwise between the constrictor tube 32 and the plate holder in the direction of the arrow 42, from an original position shown by the dotted outline 43S to the solid line position shown in FIGS. 7,8 and 9 to close the prongs onto the pivot pins 41 of the plate 11.

The nut driver 33 is slidably received inside the tube of the plate holder 31 and has two or four circularly spaced prongs 33P receivable in the axially extending tool receiver notches 24 of the nut 21 which is shown received in those prongs. These enable the use of the T-handle 33H on the nut driver to drive the nut onto the threaded post 19 of the cage.

The adjuster 34 has an L-shaped handle 34H at the proximal end. It has a distal end portion 34E (FIG. 8A) of hexagonal cross-section sized for reception in the tool receiver hole 27 of the cage. It has an external thread 34T on which the nut 21 is temporarily mounted as shown by the solid lines in FIGS. 7,8 and 9, and dotted in FIG. 8A. Thread 34T is of exactly the same diameter and pitch as the thread 26 on the cage stem 19. When the hexagonal tool end portion 34E is received in the mating hexagonal hole 27 of the cage, the thread 34T on the adjuster is precisely aligned with the thread on cage stem 19, so that the nut 21 can be advanced, when desired, from the thread on the adjuster 34 onto the stem 19 to fasten the plate to the cage.

An important feature of the invention is that the plate have omni-directional angulation with respect to the cage. For this purpose, the outer end of the cage is domed at 22 and the inner face of the plate is shaped to fit the dome but permit tilt from the cage axis to the extent needed to facilitate attachment to the vertebral bodies. The wings of the plate are contoured at 11C in a curve about axes perpendicular to a plane containing the longitudinal axis 11L of the plate and the axis of the center aperture 11A of the plate. The spherical radius of the internal seating face 23 of the plate may be slightly less than the spherical radius of the dome face 22 of the cage. The central stem-receiving aperture 11A of the plate may be sufficiently larger than the outer diameter of the stem threads 26 to accommodate the slight off-axis movement of the plate relative to the cage when a nonperpendicular attitude of the plate relative to the cage axis is needed such as shown, for example, in FIGS. 13 and 17. The arrangement may accommodate an angulation, as shown at A in FIG. 13, of as much as 10 degrees, for example.

FIG. 13, which is a section through the plate and nut assembly similar to FIG. 8A but taken at line 13—13 in FIG. 1 and without the stem showing, shows that the nut 21 also has a concave seating face 21S which seats on the convex face 11X on the outside face of the wall whose inside seating face 23 engages the dome 22 of the cage. Thus, the nut can accommodate the tilting of the plate while the nut remains securely on the axis of the stud. The outer face 21F of the nut is convex to facilitate capture in the concave surface of the distal end wall of the nut driver 33S immediately adjacent each of the prongs 33P to better accommodate the prongs in the notches 24 of the nut when tightening it.

Procedure

Following the usual preparation of the patient for anterior lateral approach to the operation field, and where the procedure is to use an endoscopic approach, three or four small access openings are provided in the patient. A surgical portal 36 is located in one of the openings for introduction of the instruments for preparing the site for introduction of a cage, followed by introduction of the cage itself. The cage may be mounted to the tool 51 (FIG. 10) in which the domed end 22 of the cage is received in the distal end of portion 52 of the installation tool with the tabs 53 of the tool portion 52 received in the notches 28 of the cage, and an internally threaded distal end of the central shaft 54 in the tool threadedly engaged with the cage stem thread 26. The central shaft is rotatable by the knob 55 at the upper end of the shaft 54, whereby the cage can be pulled snug against the distal end of the tool portion 52. For installation in the intervertebral space, the cage is guided through the portal (36 in FIG. 11) and installed in the space in the usual manner, using the handle 56 to turn the cage into the space. Once the observer is satisfied that the cage has been installed properly, the knob 55 can be turned while the handle 56 is held stationary, to unscrew the shaft from the cage end stem. Then the installation tool 51 can be removed from the domed end of the cage and withdrawn from the portal.

With the cage in place, the tool assembly according to the present invention, is prepared for introduction through the portal. The adjuster shaft 34 is inserted through the proximal end of the nut driver 33. The nut 21 is screwed onto the thread 34T on shaft 34 at the proximal end of the hexagonal distal end portion 34E of the shaft 34. This assembly is inserted into the proximal end of the plate holder/constrictor tube assembly. The outer constrictor tube 32 is retracted on the plate holder tube 31 to a point near the handle 31H. As this is done, the prongs 38 expand to the dotted line position 38S and the plate 11 is installed between the prongs 38 and the pivot pins 41 on the plate are aligned with the apertures 39 in the prongs 38. Then the constrictor tube 32 is advanced in the direction of arrow 42 by turning the knob 43 on the tube, thus camming the prongs 38 to the closed position shown in FIGS. 7 through 9, 11 and 12.

After installation of the plate 11 on the plate holder 31, the plate is pivoted on prongs 38 to the inline position shown in FIGS. 11 and 12 where the longitudinal axis of the plate is colinear with the longitudinal axis of the plate holder. Then it is introduced through the portal 36 into the operation field. Then, by the use of forceps or other appropriate manipulators introduced through one of the other openings in the body, the plate is pivoted in the direction of arrow 11P in FIG. 12 to a position where its longitudinal axis is approximately perpendicular to the longitudinal axis of the cage.

10. The assembly of claim 7 and wherein:

said inter-engaging bearing surfaces of the nut and plate include a concave spherical surface on said nut.

11. The assembly of claim 10 and wherein:

said inter-engaging bearing surfaces of the nut and plate include a convex spherical surface on the plate.

12. The assembly of claim 11 and wherein:

the fusion device includes a generally cylindrical cage having an apertured wall and an external thread.

13. The assembly of claim 1 and wherein:

the device has a domed portion at the outer end serving as one of said bearing surfaces; and

the plate has the other of said bearing surfaces engaging the domed portion of the fusion device.

14. The assembly of claim 13 and wherein:

the domed portion of the device engaged by the bearing surface of the plate is spherical.

15. The assembly of claim 14 and wherein:

the bearing surface of the plate is spherical.

16. The assembly of claim 13 and wherein:

the plate is elongate, has a longitudinal axis, and has an aperture therein with an aperture axis perpendicular to the longitudinal axis, and has two wings extending out from the said aperture, the wings having inner bearing surfaces for engaging curved exterior surfaces of vertebral bodies, the inner bearing surfaces being contoured for mating with contours of vertebral bodies.

17. The assembly of claim 16 and wherein:

the contoured inner bearing surfaces are curved about axes perpendicular to a plane containing the longitudinal axis of the plate and containing the axis of the aperture.

18. The assembly of claim 16 and wherein:

the contoured inner bearing surfaces are curved about axes perpendicular to a plane containing the longitudinal axis of the plate and the longitudinal axis of the device.

19. In a subject having a spine including at least two vertebral bodies, a method of interconnection of bone anchorage, an interbody fusion device and a plate, the method comprising the steps of:

introducing into the intervertebral space between two vertebral bodies, a fusion device adapted to be implanted in the intervertebral disc space between the two vertebral bodies in the spine and to accommodate fusion in the disc space;

receiving through an aperture in the plate, a stem fixed to the fusion device;

mounting the plate on the fusion device and seating the plate with convex surfaces of the plate positioned in concave surfaces on the vertebral bodies;

applying plate anchors to the vertebral bodies and the plate;

tightening the anchors to the plate and the vertebral bodies;

applying a fastener to the stem and engaging the plate; and

tightening the fastener on the stem and plate and thereby fastening the plate to the fusion device.

20. The method of claim 19 and further comprising the steps of:

attaching the plate to the vertebral bodies with bone screws, and tightening the bone screws thereby anchoring the plate to the vertebral bodies.

21. The method of claim 20 and further comprising the step of:

adjusting the plate to the fusion device before tightening the bone screws.

22. The method of claim 19 and further comprising the steps of:

providing contact of a part-spherical seat on the fusion device with a part-spherical seat on the plate when the fastener is tightened on the stem and the plate.

23. The method of claim 19 and further comprising the steps of:

universally swiveling the plate on the fusion device before tightening the fastener on the stem and plate.

24. The method of claim 23 and wherein the swiveling step includes:

orienting the plate such that a longitudinal axis of the plate is at an angle between zero and ten degrees from a plane perpendicular to a longitudinal axis of the fusion device.

25. The method of claim 23 and further comprising the steps of:

providing contact of a part-spherical seat on the fusion device with a part-spherical seat on the plate when the fastener is tightened on the stem and the plate.

26. The method of claim 19 and further comprising the steps of:

before mounting the plate on the fusion device;

installing a nut driver onto an adjustment shaft;

threading a nut onto a distal end portion of the adjustment shaft;

installing the adjustment shaft with nut driver thereon into a plate holder and constrictor assembly;

spreading prongs at a distal end of the plate holder, and pivotally mounting the plate to the plate holder;

pivoting the plate on the plate holder to orient the plate inline with a longitudinal axis of the plate holder;

introducing the assembly of plate, plate holder, nut driver and adjusting shaft toward the fusion device;

pivoting the plate from the inline attitude to a transverse attitude relative to the plate holder as the plate is advanced to position against one of the vertebral bodies;

installing the device stem receiving aperture of the plate onto a stem of the fusion device;

fastening the plate to each of the vertebral bodies;

advancing the nut from the adjuster shaft onto the stem of the fusion device; and

tightening the nut on the stem and thereby securing the plate on the fusion device.

27. The method of claim 26 and further comprising the steps of:

prior to fastening the plate to the vertebral bodies,

using the adjuster shaft to move the fusion device in the intervertebral space and relative to the vertebral bodies in the direction of the axis of the fusion device to any extent necessary to establish sliding swivel contact between an outer end of the fusion device and an inner bearing face of the plate.

28. An interbody fusion assembly comprising:

an interbody fusion device having an inner end and an outer end and configured to be received in the intervertebral disc space between two vertebral bodies of a human spine;

an attachment device which has first and second ends and has first and second sites, respectively, thereon adjacent

said ends, for attachment respectively to a first and second ones of the two vertebral bodies;

the attachement device and fusion device having inter-engaging bearing surfaces shaped for cooperating and accommodating various degrees of angulation between the attachment device and the fusion device, said bearing surface of the attachment device being located between the sites for attachment to vertebral bodies; and

fasteners on said devices for fixing said attachment device and said fusion device together in a selected degree of angulation.

29. The assembly of claim **28** and wherein:

the bearing surfaces include a curved concave bearing surface on one of said device.

30. The assembly of claim **28** and wherein:

the fasteners for fixing said devices together include inter-engaging screw threads on said devices.

31. The assembly of claim **30** wherein:

said inter-engaging threads include a nut having an axis and curved bearing surface thereon engaging said attachment device around said axis while fixing said devices together, independent of the degree of angulation between the attachment device and the fusion device.

32. The assembly of claim **28** and wherein:

the fusion device has a domed portion at the outer end with an outwardly-facing bearing surface thereon; and

the attachment device has an inwardly-facing bearing surface thereon engaging the bearing surface of the domed portion of the fusion device.

33. The assembly of claim **32** and wherein:

the fusion device has a threaded stem on one of said ends;

the attachment device is elongate and has an aperture therein receiving the stem through the aperture; and

a nut threaded on the stem engages the attachment device and connects the attachment device to the fusion device, the aperture being large enough to enable movement of the attachment device on the domed portion to various positions wherein the stem is at various distances from edges of said aperture.

34. The assembly of claim **33** and wherein:

said attachment device has an outwardly facing domed bearing surface engaged by an inwardly facing concave bearing surface on said nut.

35. The assembly of claim **34** and wherein:

the fusion device is an apertured bone cage, and has a tool receiver in the stem to enable preventing rotation of the cage when the nut is rotated on the stem.

36. The assembly of claim **35** and wherein:

the attachment device is a plate having pivot surface thereon with a pivot axis transverse to the elongate dimension of the plate for reception and pivoting on a plate holder installation tool assembly.

* * * * *